# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

**DRAFT**

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| Hatchery Program | Wenatchee Sockeye Program |
| Species or Hatchery Stock | Wenatchee Sockeye Salmon (*Oncorhynchus nerka*) |
| Agency/Operator | Washington Department of Fish and Wildlife |
| Watershed and Region | Lake Wenatchee/Wenatchee Subbasin/Columbia Cascade Province |
| Date Submitted | |
| Date Last Updated | August 26, 2005 |

# Section 1: General Program Description

**1.1 Name of hatchery or program.**

Wenatchee Sockeye Program

**1.2 Species and population (or stock) under propagation, and ESA status.**

Wenatchee Sockeye Salmon (*Oncorhynchus nerka*)

ESA Status: Not listed and not a candidate for listing

**1.3 Responsible organization and individuals.**

| | |
|---|---|
| Name (and title): | Rick Stilwater |
| | Eastbank Hatchery Complex Manager |
| Agency or Tribe: | Washington Department of Fish & Wildlife |
| Address: | 13246 Lincoln Road, East Wenatchee, WA 98802 |
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**Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.**

The Anadromous Fish Agreements and Habitat Conservation Plans (Mid-C. HCP) for Wells, Rocky Reach and Rock Island hydropower projects established a formal decision making body for the artificial production programs operated within the region and covered by the Mid-C. HCP. The decision making body, referred to as the Hatchery Committee, is composed of one (1) representative of each Party to include both Douglas and Chelan County PUD representatives (districts), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla) (collectively, the Joint Fisheries Parties or the JFP); and American Rivers, Inc., (American Rivers) a Washington D.C., nonprofit corporation.

The Hatchery Committee is tasked with oversight development of recommendations for implementation of the hatchery elements of the Mid-C. HCP. The Hatchery and Genetic Management Plans (HGMPs) are reflective of the decisions and implementation of actions as deemed appropriate and consistent with the Mid-C. HCP Hatchery Committee. Decisions and implementation actions made by the HCP Hatchery Committee will be dynamic and in the future, current DRAFT HGMPs would need to be updated during this on-going iterative process. Furthermore, the Hatchery Committee is responsible for determining program adjustments considering the methodology described in Biological Assessment and Management Plan (BAMP 1998) and providing recommended implementation plans to the District.

The districts are responsible for funding to include facility improvements, changes to artificial production programs, monitoring and evaluation of programs as identified in the Hatchery Compensation Plan, the Permit and the Agreement. The Districts or its designated agents shall operate the hatchery facilities according to the terms of the Section 8 “Hatchery Compensation Plan”, the ESA Section 10 permit(s), and in consultation with the Hatchery Committee.

| Co-operators | Role |
|---|---|
| Chelan PUD | Funding Source |
| Involved parties include those associated with the Columbia River Fish Management Plan and the U.S. v. Oregon court decision | Program Coordination, Co Management, and Policy |

**1.4 Funding source, staffing level, and annual hatchery program operational costs.**

| Funding Sources |
|---|
| Chelan PUD |

| Operational Information | Number |
|---|---|
| Full time equivalent staff | 13 |
| Annual operating cost (dollars) | $1,942,000 |

The sockeye supplementation program is funded by Public Utility District Number 1 of Chelan County for the purpose of mitigation for lost fish production associated with hydroelectric power system development in the region. The program is authorized under the Mid-Columbia Mainstem Conservation Plan (BAMP 1998), and the parties to this plan are therefore involved in short and long-term production planning. Costs cannot be broken out for the sockeye program specifically from the total staff and operating budget at Eastbank Hatchery Complex.

## 1.5 Location(s) of hatchery and associated facilities.

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|---|---|
| Broodstock source | Little Wenatchee and White Rivers Sockeye Salmon |
| Broodstock collection location (stream, RKm, subbasin) | Tumwater Dam-Trapping Facility/ RKm 52.0/Wenatchee |
| Adult holding location (stream, RKm, subbasin) | Lake Wenatchee (Net Pens)/RKm 91.0Lake Wenatchee/Wenatchee |
| Spawning location (stream, RKm, subbasin) | Lake Wenatchee (temporary spawning facility)/RKm 91.0Lake Wenatchee Shoreline/Wenatchee |
| Incubation location (facility name, stream, RKm, subbasin) | Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia |
| Rearing location (facility name, stream, RKm, subbasin) | Eastbank Hatchery/Columbia River/~RKm 790/Upper-Mid Columbia; and Lake Wenatchee (Net Pens)/RKm 91.0/Wenatchee. |

**1.6 Type of program.**

The Wenatchee sockeye operation is an “integrated harvest” program.

### 1.7 Purpose (Goal) of program.

The goal of this program is to mitigate for the loss of sockeye salmon that would have been produced in the Wenatchee River system in the absence of hydroelectric dam development in the Columbia Basin. This goal can be met through the use of the artificial environment of fish rearing facilities to increase the overall productivity of the population by increasing survival at life-history stages where competitive or environmental bottlenecks occur. Concurrently, a release strategy for artificial production is employed that will not create a new bottleneck in productivity through competition with the naturally produced component of the population. The program cultures sockeye endemic to the Wenatchee River Basin.

### 1.8 Justification for the program.

Sockeye salmon in the Columbia Basin have declined substantially from historic levels. Historic runs were as large as 3 million fish. Most of the original production of sockeye occurred in nursery lakes located in the uppermost reaches of the Columbia and Snake River basins. Upstream passage was blocked by the construction of several key dams including: Grand Coulee Dam (completed 1941) and Chief Joseph Dam (completed 1958) in the upper Columbia system; and by Swan Falls (1901), Sunbeam (1913-1934), Black Canyon (1914), and Brownlee (1958) dams in the Snake system. Landlocked sockeye salmon, commonly called kokanee, are still produced in many of the areas that formerly contained anadromous runs. Currently, anadromous populations of sockeye originate almost exclusively from natural production in the Wenatchee and Okanogan basins. Sockeye salmon in the Columbia River return as age-3, age-4, and age-5 fish with peak passage over Bonneville Dam around July 1. Spawning occurs in September and October. Juveniles normally rear in a freshwater nursery lake for at least one full year before migrating to the ocean. Columbia River sockeye are the southernmost sockeye run in North America.

**Authorization through Section 10(a)(1)(B) Permit Number #1347.** WDFW and joint permit holder, Public Utility District No. 1 of Chelan County (Chelan PUD) have authorization for this program through a Section 10 Permit allowing incidental take of upper Columbia spring Chinook and steelhead resulting from the propagation of unlisted sockeyeChinook at Eastbank, Wells, Priest Rapids, Lake Wenatchee sockeye, and cooperative releases. The permit expires on October 22, 2013.

The Washington Department of Fish and Wildlife (WDFW) and Chelan PUD are authorized an incidental take of endangered Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) and endangered UCR spring Chinook salmon (*O. tshawytscha*) as a result of artificial propagation programs for the enhancement of sockeye salmon, as cited in the WDFW application and the *Anadromous Fish Agreement and Habitat Conservation Plan* with Chelan PUD for the operation of Rocky Reach Dam, and the *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b), subject to the provisions of Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531-1543), NOAA's National Marine Fisheries Service (NMFS) regulations governing ESA-listed species permits (50 CFR Parts 222-226), and the conditions hereinafter set forth.

**Abstract:**

The permit authorizes the WDFWand the Chelan PUD annual incidental take of adult and juvenile, endangered, naturally produced and artificially propagated, UCR spring Chinook salmon and UCR steelhead of ESA-listed species associated with the implementation of non-ESA-listed sockeye salmon artificial propagation programs in the Wenatchee River Basin. The program is intended to supplement naturally spawned unlisted ChinookChinooksockeye salmon (*O. nerka*) occurring in the Wenatchee River and its tributaries. The artificial propagation programs exist to mitigate for lost sockeye salmon, or lost sockeye productivity, resulting from the construction and operation of Rock Island Dam on Columbia River. ChinookThe artificial propagation program may lead to incidental take of migrating ESA-listed adult spring Chinook salmon and steelhead during unlisted sockeye broodstock trapping activities, and incidental take of rearing and emigrating ESA-listed juvenile spring Chinook salmon and steelhead resulting from the release of artificially-propagated unlisted sockeye juveniles into the natural

environment, and during monitoring and evaluation activities of the hatchery programs that occur in the natural environment. Limitations on unlisted adult sockeye broodstock collection locations and timing; limits on the number, timing, and location of juvenile sockeye releases; and operational guidelines applied to minimize the risks of disease transmission, water quality impairment, and fish loss through hatchery fish screening or water withdrawals for facility operations are some strategies that the WDFWand Chelan PUD will employ to minimize risks to listed fish. Sockeye survival and straying levels will be monitored through externally marking hatchery fish, and/or through internal coded wire or passive integrated transponder (PIT) tagging of a representative proportion of annual juvenile fish releases. The Chelan PUD and WDFWas joint permit holders, have specific conditions relating to their involvement and obligation under the HCPs and the permit. The WDFW as the primary operator of the hatchery facilities and as a managing agency of the fish resources of the State, also has specific conditions and responsibilities. The failure of one permit holder to satisfy their conditions may result in the loss of take authorization for all permit holders. Thereby, an interdependent and cooperative relationship should be encouraged in carrying out the authorized activities.

**Unlisted salmon artificial propagation program activities will include:**

- The collection of broodstock through trapping operations at: ChinookChinookTumwater Dam for ChinookWenatchee sockeye salmonChinook.
- The holding and artificial spawning of collected adults at Eastbank and Lake Wenatchee Net Pens.
- The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Eastbank Hatchery complex facilities.
- The transfer of Chinooksockeye salmon fingerlings or pre-smolts from the hatcheries for rearing at the net-pens in Lake Wenatchee.
- The release of ChinookChinooksockeye salmon pre-smolts into Lake Wenatchee from net-pens in Lake Wenatchee.
- The monitoring and evaluation of these artificial propagation programs in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans to be developed by the HCP Hatchery Committees as called for in the HCPs.

Included in the incidental take are conditions of the permit including:
Section A. Take Description and Levels
Section B. Production Levels
Section C. Program Management and Operating Conditions
Section D. Reports and Annual Authorization
Section E. Penalties and Sanctions

**Operation of WDFW Facilities and Practices:**

- Water rights are formalized through trust water rights from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
- *National Pollutant Discharge Elimination System Permit Requirements* This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE). This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired. Conduct routine water monitoring to ensure that the levels of total suspended solids, settleable solids, and water temperature at each facility to remain compliant with NPDES permits issued by Washington Department of Ecology.
- *Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

- Conduct routine, generally monthly, fish growth monitoring during rearing at each facility;
- Dispose of juvenile and adult carcasses via the local solid waste management system, on-station burial, or distributing carcasses into the river system of origin for nutrient enhancement after appropriate fish health certification. WDFW proposes to implement the following measures into the propagation program operation to minimize potential negative impacts on ESA-listed species.
- *Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington*. These guidelines define practices that promote maintenance of genetic variability in propagated salmon. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
- *Spawning Guidelines for Washington Department of Fisheries Hatcheries*. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).
- *Stock Transfer Guidelines*. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally-adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991). WDFW proposes to implement the following measures into the propagation program operation to minimize potential negative impacts on ESA-listed species:

### 1.9 List of program "Performance Standards".

See Section 1.10 below.

### 1.10 List of program "Performance Standards", designated by “benefits” and “risks.”

*“Performance Indicators” determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.*

*The NPPC “Artificial Production Review” document referenced above presents a list of draft “Performance Indicators” that, when linked with the appropriate performance standard, stand as examples of indicators that could be applied for the hatchery program. If an ESU-wide hatchery plan is available, use the performance indicator list already compiled. Essential ‘Performance Indicators” that should be included are monitoring and evaluation of overall fishery contribution and survival rates, stray rates, and divergence of hatchery fish morphological and behavioral characteristics from natural populations.*

*The list of “Performance Indicators” should be separated into two categories: "benefits" that the hatchery program will provide to the listed species, or in meeting harvest objectives while protecting listed species; and "risks" to listed fish that may be posed by the hatchery program, including indicators that respond to uncertainties regarding program effects associated with a lack of data.*

**1.10.1) "Performance Indicators" addressing benefits**.
(e.g. "*Evaluate smolt-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.*").

**1.10 Benefits:**

| Performance Standards | Performance Indicators | Monitoring and Evaluation |
|---|---|---|
| 1.Increase the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population and the changes in the natural replacement rate (NRR) of the supplemented population (reference population) is similar to that of the non-supplemented population. | Natural Replacement Rate (NRR).<br><br>Ho: $\Delta$ Total spawners $_{\text{Supplemented population}}$ > $\Delta$ Total spawners $_{\text{Non-supplemented population}}$<br><br>Ho: $\Delta$ NOR $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$<br><br>Ho: $\Delta$ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$ | Spawning escapement and spawning origin composition of supplemented and non-supplemented (reference) populations. |
| 2. Maintain run timing, spawn timing, and spawning distribution of endemic populations. | Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$<br><br>Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$<br><br>Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$ | Monitor and evaluated supplemented and non supplemented (reference) population run-timing, spawn timing and redd distribution. |
| 3. Maintain endemic population genetic diversity, population structure, and effective population size Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations. | Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop.}}$<br><br>Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$<br><br>Ho: $\Delta$ Spawning Population = $\Delta$ Effective Spawning Population<br><br>Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$<br><br>Ho: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$ | Periodic (each 5 years) genetic analysis of hatchery and naturally adult and juvenile fish in the supplemented population and natural origin fish in the non-supplemented population.<br><br>Monitor and evaluate run timing, spawn timing, redd distribution, size and age at maturity, and effective population size of supplemented and non-supplemented populations. |
| 4. Achieve/maintain adult-to-adult survival (i.e., hatchery replacement rate) that is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific HRR expected value based on survival rates listed in the BAMP (1998). | Ho: HRR $_{\text{Year x}}$ > NRR $_{\text{Year x}}$<br><br>Ho: HRR $\geq$ Expected value per assumptions in BAMP | Monitor and evaluate hatchery and natural adult-to-adult replacement rate in the supplemented populations. |
| 5. Maintain the stray rate of hatchery fish below the acceptable levels to maintain genetic variation between stocks. | Ho: Stray rate $_{\text{Hatchery fish}}$ < 5% of total brood return<br><br>Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations. | Monitor and evaluate hatchery stray rates and proportional contribution to natural spawning aggregates. |

| | | |
|---|---|---|
| | Ho: Stray hatchery fish < 10% of spawning escapement of any non-target streams within independent population. | |
| 6. Provide release of hatchery fish consistent with programmed size and number. | Ho: Hatchery fish $_{Size}$ = Programmed $_{Size}$<br><br>Ho: Hatchery fish $_{Number}$ = + 10% of Programmed $_{Number}$ | Monitor fish size and number at release. |
| 7. Maintain the proportion of hatchery fish on the spawning grounds at a levels that minimize negative affects to freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams with similar adult seeding levels. | Ho: Δ smolts/redd $_{Supplemented\ population}$ > Δ smolts/redd $_{Non\text{-}supplemented\ population.}$ | Monitor and evaluate annual smolt production in supplemented and non-supplemented populations.<br><br>Monitor and evaluate redd deposition in supplemented and non-supplemented populations. |
| 8. Provide no significant increase in incidence of disease in the natural and hatchery populations. | Ho: Conc. $_{disease}$ supplemented fish $_{Time\ x}$ = Conc. $_{disease}$ supplemented fish $_{Time\ x}$<br><br>Ho: Conc. $_{disease}$ supplemented stream $_{Time\ x}$ = Conc. $_{disease}$ non-supplemented stream $_{Time\ x}$<br><br>Ho: Conc. $_{disease}$ hatchery effluent $_{Time\ x}$ = Conc. $_{disease}$ hatchery effluent $_{Time\ x}$<br><br>Ho: Conc. $_{disease}$ supplemented stream $_{Upstream\ Time\ x}$ = Conc. $_{disease}$ hatchery effluent $_{Time\ x}$ = Conc. $_{disease}$ supplemented stream $_{Downstream\ Time\ x}$ Ho: Hatchery disease $_{Year\ x}$ = Hatchery disease $_{Year\ y}$ | Perform diagnostic disease investigations in the hatchery population and natural population, in supplemented and non-supplemented streams. |
| 9. Minimize adverse impacts to non-target taxa of concern (NTTOC). | Ho: NTTOC abundance $_{Year\ x\ through\ y}$ = NTTOC abundance $_{Year\ y\ through\ z}$<br><br>Ho: NTTOC distribution $_{Year\ x\ through\ y}$ = NTTOC distribution $_{Year\ y\ through\ z}$<br><br>Ho: NTTOC size $_{Year\ x\ through\ y}$ = NTTOC size $_{Year\ y\ through\ z}$ | |

### 1.10.1 Risks:

| Performance Standards | Performance Indicators | Monitoring and Evaluation |
|---|---|---|
| 1. Artificial propagation activities comply with ESA responsibilities to minimize impacts and/or interactions to ESA listed fish | Project complies with Section 10 permit conditions including juveniles are raised to subyearling stage (25 and 12 fish/lb) and released from the net pens for over winter rearing in the lake. All fish are adipose fin clipped to identify them from naturally produced fish. | As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented. Required data are generated through the M & E plan and provided to NOAA Fisheries as required per annual report compliance. |
| 2. Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring. | All facilities meet WDFW water right permit compliance and National Pollution Discharge Elimination System (NPDES) requirements. Total on-site production and feed fed monthly falls within limits of not needing a NPDES permit. | Flow and discharge reported in monthly NPDES reports. Environmental monitoring of total suspended solids, settle-able solids, in-hatchery water temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions. |
| 3. Water intake systems minimize impacts to listed wild salmonids and their habitats. Passive water supply is supplied by Lake Wenatchee, net pen proper mesh size constrain fish within the net pen environment. | Net pen siting plan and operational program minimize impact to the Lake environment.<br><br>Net Pen mesh size - designed to allow flow through and keep fish constrained within the pens until program release. | Hatcheries participating in the programs will maintain all mesh sizes consistent with program goals with siting and lake environment preventing impingement, injury, or mortality to listed salmonids. |
| 4. Hatchery operations comply with all ESA permit requirements. | Section 10 annual reports are submitted in compliance with permits. | Section 10 annual reports are submitted in compliance with permits. |
| 5. Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration | Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility. | Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed |
| 6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized. | Program has emergency response plan- Net pen complex is monitored in case of bad weather. Fouling or debris is removed from net pens.<br>Staffing allows for rapid response for protection of fish from risk sources (water loss, power loss, etc.).<br>Multiple rearing sites (net pens) or footprints for rearing.<br>Densities at minimum to reduce risk of loss to disease.<br>Sanitation – all equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc. | Hatchery engineering design and construction accommodate security measures.<br>Operational funding accommodates security measures.<br>Training in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station.<br>Maintenance is conducted as per manufacturer's requirements and according to hatchery maintenance schedules. |

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|---|---|---|
| 7. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish. | Hatchery sockeye reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (fpp by late fall).<br><br>Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors.<br><br>All listed fish encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hrs and follow permit protocols.<br><br>All listed fish will be released upstream or returned to natal streams immediately. | Fish culture and evaluation staff monitor behavior, fish growth and condition. Fish health specialists will certify all hatchery fish before release.<br><br>Broodstock collection protocols will be developed each season and reviewed by the HCP Hatchery committees. |

### 1.11.1 Proposed annual broodstock collection level (maximum number of adult fish).

Up to 260 fish can be collected. After net pen holding mortality, up to 260 fish could be required for the 250,000 egg take goal (FBD 2005).

### 1.11.2 Proposed annual fish release levels (maximum number) by life stage and location.

Up to 200,000 subyearlings are released from net pens into Lake Wenatchee (RKm. 91) a tributary of the Wenatchee River (Columbia Cascade province). Fish size at release has increased with two groups targeted for release at 25 and 12 fpp in the late summer or early fall.

Future increases in the number of sockeye produced each year through this program are proposed within the MCMCP (1998) but have not taken place. To increase production of sockeye salmon in the Wenatchee River in future years, the net pens at Lake Wenatchee may be enlarged by 225% to acclimate and release an additional 450,000 sockeye salmon. Seventeen net pens or other in-basin acclimation facilities would be required to meet the total production goal (650,000 subyearlings).

## 1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

*SARs:*

Smolt to adult survival for sockeye produced in the Wenatchee program has been estimated as 0.4 % to about 2 % (Chapman et al. 1995), with an historic baseline survival rate of 0.4 – 0.7 % up to brood year 1996 (MCMCP 1998). Survival of sockeye is variable and can fluctuate with some very low brood year survival (1991) while 1989 brood year sockeye were estimated to have an overall survival rate (fishery harvest plus escapement) of 2.3 % (Chapman et al. 1995). Smolt to adult survival data is available from CWT analysis through brood year 1996. Through brood year 1999, program releases were only adipose fin clipped. Data recovery on CWT groups starting in 2001 are incomplete at this time **(Table 1).**

*Escapement:*

The most recent five-year average annual escapement for Wenatchee Basin sockeye salmon is 13,776. This compares with a 30,915 5 year average (1989-1993) and 6,928 5 year average for the period from 1994-1998 (Table 2).

**Table 1**. Available data from the APRE website.

| Brood Year | HoRs | | Combined (HoRs + NoRs) | |
|---|---|---|---|---|
| | Smolt to Adult Survival (%) | Recruits per Spawner | Smolt to Adult Survival (%) | Recruits per Spawner |
| 1990 | 0.12 | 1.38 | M | 0.025 |
| 1991 | 0.004 | 0.02 | M | 0.23 |
| 1992 | 0.14 | 1.35 | M | 0.30 |
| 1993 | 0.06 | 0.4 | M | 0.44 |
| 1994 | 0.01 | 0.07 | M | 0.11 |
| 1995 | 0.49 | 0.62 | M | 0.20 |
| 1996 | 2.14 | 4.0 | M | 4.55 |
| 1997 | Data NA | Data NA | Data NA | Data NA |
| 1998 | Data NA | Data NA | Data NA | Data NA |
| 1999 | Data NA | Data NA | Data NA | Data NA |
| 2000 | Data NA | Data NA | Data NA | Data NA |
| 2001 | Data NA | Data NA | Data NA | Data NA |
| 2002 | Data NA | Data NA | Data NA | Data NA |

**Table 2.** Sockeye Escapement from 1989 – 2003

| Return Year | Number of Adults[1] | Return Year | Number of Adults[1] |
|---|---|---|---|
| 1989 | 21,185 | 1998 | 3,379 |
| 1990 | 34,847 | 1999 | 4,260 |
| 1991 | 34,678 | 2000 | 19,084 |
| 1992 | 26,555 | 2001 | 38,620 |
| 1993 | 37,311 | 2002 | 31,946 |
| 1994 | 9,314 | 2003 | 4,424 |
| 1995 | 4,474 | 2004 | NA |
| 1996 | 7,759 | 2005 | NA |
| 1997 | 9,714 | | |

[1]Based upon Rock Island/Rocky Reach inter dam difference. WDFW Data Base.

### 1.13 Date program started (years in operation), or is expected to start.

The program was initiated in 1989.

### 1.14 Expected duration of program.

The supplementation program will continue with the objective of mitigating the loss of sockeye salmon productivity caused by hydroelectric dams in the Columbia River Basin.

**1.15 Watersheds targeted by program.**

Lake Wenatchee/Wenatchee Subbasin/Columbia Cascade Province

**1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.**

### 1.16.1 OVERVIEW

Wenatchee sockeye hatchery program level is a 200,000 subyearling released at 20 fish per pound (FPP). The goal of the program is to compensate for fish killed as the result of operation of Rock Island Dam. Prior to 2000, unfed fry were transferred to the net pens at Lake Wenatchee in late March to early April. Early spring winds and cold water hampered efforts to adequately feed these small fish and as a result were never able to meet the 20 FPP goal or reach tagging size before water temperatures and handling stress associated with tagging posed a significant health risk (as a result, coded wire tagging CWT was abandoned for a period of years due to significant loss associated with tagging activities).

Broodstock are collected from Tumwater Dam on the Wenatchee River and transported to Lake Wenatchee Net Pens until spawning. Holding adults in net pens on surface water significantly limits control or prevention of diseases. Adult disease related mortality reduces the programs ability to meet its mitigation requirements.

Beginning with the 1999 brood, the program was changed and fish are reared at Eastbank FH until they can be CWT. Fish are transferred to Lake Wenatchee for final rearing in June. To assess the efficacy of time and size at release in reducing predation and disease related mortality, the new program requires fish be released at the end of August at approximately 25 FPP and end of October at approximately 12 FPP. Under this program design the current juvenile facilities are inadequate to rear fish at the appropriate densities. Sockeye are released from the net pens directly into the lake. Overwinter survival (i.e., release to smolt survival) is evaluated by means of a smolt trap located at the mouth of the lake. Limited capital expenditures, inadequate hatchery facilities, and changes in EPA and DOE policy regarding net pens have been the key issues with the program.

### 1.16.2 POTENTIAL ALTERNATIVES

ALTERNATIVE 1

Adult sockeye are currently transferred to net pens located at Lake Wenatchee. Sockeye are spawned and gametes are transported to Eastbank FH for fertilization and incubation. This alternative has been reasonably successful but involves significant logistical coordination. Furthermore, the inability to treat adults for disease results in excessive prespawn mortality. Without adequate rearing space sockeye are exposed to densities much greater than what is recommended.

ALTERNATIVE 2 (WDFW endorsed)

Modify or construct adult sockeye holding ponds at Eastbank FH that has the appropriate water source and temperature regime for adult holding and spawning. Construction of additional rearing vessels at Eastbank FH that allow groups of sockeye to be reared to the appropriate size and density. Construct long-term acclimation ponds (Two Rivers site has been suggested) or expand existing net pens rearing space (June through October) on Lake Wenatchee.

An adult holding pond with appropriate water temperature located at Eastbank FH would minimize the handling stress of adults and reduce disease related mortality. Adequate water temperatures are also essential in disease treatment/prevention, maximizing gamete quality, and fertilization rates.

Adequate rearing vessels would afford hatchery personnel greater flexibility in feeding regimes to ensure

fish are of the appropriate size at tagging, release, and or transfer. Releasing fish below the recommended size reduces the overwinter and smolt to adult survival rate.

### 1.16.3 POTENTIAL REFORMS AND INVESTMENT

Investigations should be conducted to assess predator/prey interactions in Lake Wenatchee. Information gathered from such investigations would provide valuable insight to the carrying capacity of the lake and identify potential limiting factors.

Juvenile acclimation/rearing is necessary for proper imprinting and producing high quality smolts. Additional net pens or acclimation facilities are necessary to provide the maximum survival benefit (e.g. density, disease, and homing fidelity) while meeting environmental guidelines established for net pen programs.

An adult holding pond at Eastbank FH with cooler pathogen free well water would provide increased protection and a means to treat disease outbreaks. The surface temperature profile of Lake Wenatchee during the adult holding period (July through mid-October) exposes adults to temperatures in excess of 21 $^{o}$C during their maturation period. In extreme years (e.g., 1998), high water temperatures resulted in high adult mortality (33%) due to *Columnaris* and subsequent low fertilization rates (Tonseth et al. 2002).

# Section 2: Program Effects on ESA-Listed Salmonid Populations

## 2.1 List all ESA permits or authorizations in hand for the hatchery program.

WDFW has the following permits for hatchery operations in the Upper and Mid-Columbia:

**Section 10(a)(1)(B) Permit Number 1347 Permit Type:** Incidental take of upper Columbia spring Chinook and steelhead resulting from the propagation of unlisted sockeye, summer and fall Chinook at Eastbank, Wells, Priest Rapids, Lake Wenatchee sockeye, and cooperative releases. Expires October 22, 2013.

**Section 10(a)(1)(B) Permit Number**: **1248 Permit Type:** Incidental take of ESA-listed anadromous fish species associated with seven recreational fishery programs to be conducted above Priest Rapids Dam on the Columbia River. This permit expired at the end of 2004 and is being renewed to include all fisheries above the Highway 395 Bridge in Pasco. This permit was submitted to NOAA for a renewal March 16, 2005 and is awaiting approval.

**Section 10(a)(1)(B) Permit Number: 1482 (1203)** Authorizes the take of ESA-listed upper Columbia River salmon and steelhead associated with research activities in the upper Columbia River Basin. This permit was modified in 2004 and the issue date is pending NOAA approval.

**Authorizations**

**FERC processes:**
Under current settlement agreements and stipulations, the three mid-Columbia PUDs pay for the operation of hatchery programs within the Columbia Cascade Province. These programs determine the levels of hatchery production needed to mitigate for the construction and continued operation of the PUD dams.

**Habitat Conservation Plans:**
In 2002, habitat conservation plans (HCPs) were signed by Douglas and Chelan PUDs, WDFW, USFWS, NOAA Fisheries, and the Colville Confederated Tribes. The overriding goal of the HCPs are to achieve no-net impact on anadromous salmonids as they pass Wells (Douglas PUD), Rocky Reach, and Rock Island (Chelan PUD) dams. One of the main objectives of the hatchery component of NNI is to provide species specific hatchery programs that may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. The PUDs can be added as joint Section 10 permit holders (#1196) in accordance with the three HCPs such as happened in 2004.

**Biological Assessment and Management Plan:**
The biological assessment and management plan (BAMP) was developed by parties negotiating the HCPs in the late 1990s. The BAMP was developed to document guidelines and recommendations on methods to determine hatchery production levels and evaluation programs. It is used within the HCP as a guiding document for the hatchery programs.

### 2.2.1 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

**Identify the NMFS ESA-listed population(s), that will be directly affected by the program.**
None.
**Identify the NMFS ESA-listed population(s), that may be directly affected by the program.**

**Upper Columbia River ESU spring Chinook** (*Oncorhynchus tshawytscha*). All spring Chinook in the Upper Columbia ESU were listed as Endangered under the ESA. Listed as an endangered species on March 24, 1999.

**Upper Columbia River ESU summer steelhead trout** (*Oncorhynchus mykiss).* The Upper Columbia River (UCR) Steelhead ESU was listed as Endangered on August 18, 1997. NOAA Fisheries is currently reviewing this listing in light of the decision to include hatchery produced UCR steelhead in the ESU. The final determination for this and nine other *O. mykiss* ESUs is expected in December of 2005.

**Bull Trout populations** (*Salvelinus confluentus*). Columbia River Distinct Population Segment) On June 12, 1998 bull trout in the Upper Columbia Distinct Population Segment (DPS) were listed as threatened under federal ESA by the USFWS.

### 2.2.2 Status of ESA-listed salmonid population(s) affected by the program.

**Describe the status of natural population relative to critical and viable population thresholds.**
Critical habitat was designated for UCR spring Chinook salmon and UCR steelhead in 2000 when NMFS published a final rule in the Federal Register (February 16, 2000 65 FR 7764). However, the critical habitat designations were vacated and remanded to NMFS for new rulemaking pursuant to a court order in April 2002. The designation of critical habitat for the UCR spring Chinook salmon ESU or UCR steelhead ESU will trigger a re-initiation of ESA consultation.

- **Provide the most recent 12 year (e.g. 1988-present) progeny to parent ratios, survival data by life stage, or other measures of productivity for the listed population. Indicate sources of these data.**
- **Provide the most recent 12 year (e.g. 1988-present) estimates of annual spawning abundance estimates, or any other abundance information. Indicate sources of these data.**
- **Provide the most recent 12 year (e.g. 1988-present) estimates of annual proportions of direct hatchery origin and listed natural origin fish on the natural spawning grounds, if known. Indicate sources of these data.**

Sources for these sections are taken from the Section 10 Direct Take Permit (#1395, #1196), WDFW Application for Permits # 1395 and #1196 and ESA Section 7 Consultations for Permit # 1395 – 2002, and #1196 - 1998).

**Upper Columbia River ESU summer steelhead:** The ESU includes naturally-spawned populations of steelhead in tributaries of the Columbia River upstream from the Yakima River, including the Okanogan River. The Wells Hatchery stock steelhead were included in the listed ESU. Critical habitat for the ESU was designated on February 16, 2000 and included all river reaches accessible to listed steelhead (and associated riparian zones) in Columbia River tributaries between the Yakima River and Chief Joseph Dam (NPPC 2001). Survival of natural-origin steelhead has been severely depressed

such that 81% of the natural spawning escapement is hatchery-origin fish (Busby 1996 as quoted in Bugert 1998). The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing. Since 1997, the WDFW has been developing a Wenatchee River stock for the juvenile released into the Wenatchee basin. Currently, there is probably a close resemblance between the natural and hatchery populations in this ESU because of the incorporation of naturally-spawning adults into the hatchery program and the large number of hatchery fish that have been spawning in the natural environment (65-80 percent of the spawning population in the Methow basin; Busby *et al.* 1996). Since natural replacement rates of UCR steelhead are low (0.3:1), the hatchery supplementation programs were determined to be essential for recovery and included in the endangered listing under the ESA. These hatchery fish could be used to reduce the short-term risk of extinction and aid in the recovery of the UCR steelhead ESU.

Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest on the west coast (up to 7 years old), probably due to the ubiquitous cold water temperatures (Mullan *et al.* 1992). Adult steelhead from this ESU enter the lower Columbia between May and September with fish arriving at Wells Pool in early July. Fish enter the Wenatchee and Methow Rivers in mid-July and peak between mid-September and October. During winter, adult steelhead generally return to the warmer Columbia River and re-enter the Methow to begin spawning in mid-March after the ice has thawed. Spawning continues through May and many fish seek out higher reaches in the tributaries. Fry emergence occurs that summer and juveniles rear for two to four years prior to spring downstream migration. On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Table 7). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Table 7).

**Table 3.** Interim abundance targets of naturally produced steelhead by basin and approximate natural origin broodstock collection goal.

| Basin | Interim Abundance Target | Broodstock Goal |
|---|---|---|
| Wenatchee | 2,500 | at least 104 [a] |
| Entiat | 500 | - - |
| Methow | 2,500 | maximum 123 [b] |
| Okanogan | 600 | 16 |
| Small Tributaries | 200 | - - |
| **Total** | **6,300** | **243** |

[a] *Proportional to run-at-large in years when run is composition is 50% or greater natural origin steelhead, otherwise goal is 50% naturally produced steelhead. Total broodstock collection goal is generally about 208 steelhead..*

[b] *Combined WDFW Methow/Okanogan programs will not exceed 30% natural origin steelhead in the broodstock. Up to 373 steelhead may be collected for broodstock total.*

Returns of both hatchery and naturally produced steelhead to the UCR basin have increased in recent years. The average 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g.,hatchery/natural

fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003). In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003). A 5-year geometric mean (1997-2001) of approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4 percent per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35 to 29 percent, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9 percent per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of natural origin spawners dropped from 19 percent for the period prior to the 1998 status review to 9 percent for the 1997 to 2001 returns. Naturally produced steelhead made up an average of 17.8 percent of the steelhead run at Priest Rapids Dam during the 18-year period from 1986 to 2001. These natural origin steelhead are not equally distributed among the UCR tributary basins. Mullen *et al*. (1994) reported annual escapement to the Methow basin at only 10 percent natural origin steelhead; however, in recent years the WDFW (2002) report natural origin steelhead composition of 5 to 11 percent in 1998 through 2000 at Wells Dam. The escapement to the Wenatchee basin from 1998 to 2000 averages 430 natural origin steelhead.

The average 2000- 2003 return counted through the Priest Rapids Dam fish ladder was approximately 18,620 fish with 3049 wild fish. The 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. By October 2004, over 18,000 steelhead had passed Priest Rapids Dam by early October. The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003). In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003).

**Upper Columbia River ESU Spring Chinook:**

The UCR spring Chinook salmon ESU, listed as endangered on March 24, 1999 (64 FR 14308), includes all natural-origin stream-type Chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River Basins (Myers *et al.* 1998). All stocks, with the exception of the Methow stock, were considered by WDF *et al.* (1993) to be of native origin, of natural production type, and as depressed in status. When listing the UCR spring Chinook salmon as endangered, NMFS included six hatchery populations as part of the ESU: Chewuch River, Methow River, Twisp River, Chiwawa River, White River, and Nason Creek. These six hatchery populations were considered to be essential for recovery and were therefore listed as part of the ESU. Hatchery populations that were derived from Carson spring Chinook salmon stock at Leavenworth, Entiat and Winthrop National Fish Hatcheries were not included as part of the ESU.

NMFS has proposed Interim Recovery Abundance Levels and Cautionary Levels (Ford *et al.*2001). Cautionary Levels were characterized as natural origin abundance levels that the population fell below only about 10 percent of the time during a historical period when it was considered to be relatively

healthy. The three independent populations of spring Chinook salmon identified for the ESU include those that spawn in the Wenatchee, Entiat, and Methow Basins (Ford *et al.* 2001).

All three of the existing UCR spring Chinook salmon naturally reproducing populations have exhibited similar downward trends and patterns in abundance over the past 40 years (NMFS 2003c, 2003d, 2003e). Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring Chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent). Redd counts in the three basins have improved in recent years, largely because of natural spawning by artificially propagated spring Chinook salmon (Grassell 2003; Grassell 2004; Mosey and Murphy 2002; Hamstreet and Carie 2004; Humling and Snow 2004). Artificially propagated juvenile spring Chinook salmon are released into the Chiwawa River with the expectation that as adults they will return and spawn in the Chiwawa River. In reality, these hatchery released fish have contributed an average of 50 percent of the spawners in the Chiwawa River and an average of 25 percent of the spawners in Nason Creek (Andrew Murdoch, WDFW, pers. com.). The propagation program spring Chinook salmon that return to spawn in Nason Creek are considered strays and of potential adverse risk to the Nason Creek component of the population; measures to improve the fidelity of hatchery reared spring Chinook salmon to the Chiwawa River are being explored. Additionally, a new artificial propagation program that releases locally derived juveniles into Nason Creek is likely to occur within the next five years. The reproductive effectiveness of these hatchery-origin salmon is not known at this time. However, preliminary indications in the Wenatchee River Basin suggest that the Chiwawa spring Chinook salmon program is contributing to natural reproduction in successive generations (Andrew Murdoch, WDFW, pers. com.). Successful reproduction over generations has not been demonstrated for the other basins as yet. A summary of recent redd count data and spawner composition is provided in Table 10. All three of the existing UCR spring Chinook salmon naturally reproducing populations have exhibited similar downward trends and patterns in abundance over the past 40 years (NMFS 2003c, 2003d, 2003e). Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring Chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent). Redd counts in the three basins have improved in recent years, largely because of natural spawning by artificially propagated spring Chinook salmon (Grassell 2003; Grassell 2004; Mosey and Murphy 2002; Hamstreet and Carie 2004; Humling and Snow 2004). Artificially propagated juvenile spring Chinook salmon are released into the Chiwawa River with the expectation that as adults they will return and spawn in the Chiwawa River. In reality, these hatchery released fish have contributed an average of 50 percent of the spawners in the Chiwawa River and an average of 25 percent of the spawners in Nason Creek (Andrew Murdoch, WDFW, pers. com.). The propagation program spring Chinook salmon that return to spawn in Nason Creek are considered strays and of potential adverse risk to the Nason Creek component of the population; measures to improve the fidelity of hatchery reared spring Chinook salmon to the Chiwawa River are being explored. Additionally, a new artificial propagation program that releases locally derived juveniles into Nason Creek is likely to occur within the next five years. The reproductive effectiveness of these hatchery-origin salmon is not known at this time. However, preliminary indications in the Wenatchee River Basin suggest that the Chiwawa spring Chinook salmon program is contributing to natural reproduction in successive generations (Andrew Murdoch, WDFW, pers. com.). Successful reproduction over generations has not been demonstrated for the other basins as yet.

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for guarded optimism, NMFS finds that there has been no genuine change in the species' status since they were listed as endangered, and the biological requirements are not being met with respect to abundance, distribution, or overall trend.

**Provide the most recent 12-year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

***UCR Spring Chinook:***
The NRR for the Wenatchee, Entiat, and Methow populations has ranged from 1.4 to 0.4 from 1958 to 1995 broodyears. The NRR has not been above 1.0 since the mid-1970's for the Wenatchee and Methow populations and the mid-1980's for the Entiat population (Ford et al., 2001). Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft). UCR Spring Chinook are extinct in the Okanogan River basin.

***UCR Steelhead:*** The Natural Return Ratios (NRR) or wild adult-to-adult survival rates for the Methow/Okanogan populations have been estimated as between 0.05 – 0.35 from 1975 to 1991. For the Wenatchee/Entiat populations, the NRR are estimated to have ranged from 0.1 – 0.9 during this same time (Ford et al., 2001). The Biological Requirements Committee concluded that the UCR steelhead populations are not able to sustain themselves naturally, but it is not clear if they would go extinct without ongoing supplementation. The uncertainty surrounding the reproductive success of hatchery steelhead confounds these analyses. Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft).

In areas above Priest Rapids Dam, several methods have been used to estimate the number of steelhead spawners and juveniles that the available habitat may be capable of supporting. These estimates for the UCR basin range from 1,603 to 8,281 depending on the estimation method (Ford *et al*. 2001). The Interior Columbia Basin Technical Recovery Team (TRT) is reviewing the available data and is expected to provide escapement recommendations for recovery of all ESA-listed UCR species. The WDFW proposes to manage artificially propagated steelhead at levels above the interim abundance targets developed by NMFS (Lohn 2002) until the TRT recommendations are available. NMFS has not developed abundance targets for the Okanogan basin or other smaller tributaries.

*Wild production -*
The population status of listed steelhead smolts produced in the region has been estimated by WDFW (L. Brown, WDFW pers. comm). The number of steelhead juveniles that may be produced are indicated by the following subbasin production capacities for wild steelhead smolts in the region (WDF et al. 1993; MCMCP 1997):

- Wenatchee 62,167
- Entiat 12,739
- Methow 58,552
- Okanogan 17,570
- Total 151,028

Recent ten-year (1987-96) average seeding levels estimated for the region indicate potential wild smolt production at 109.5% of the modeled production capacities (MCMCP 1997):

- Wenatchee 73,371
- Entiat 10,728
- Methow 65,586
- Okanogan 15,660
- Total 165,345

**Provide the most recent 12 year (e.g. 1988-present) annual spawning abundance estimates, or any other abundance information. Indicate source of these data.**

***UCR Steelhead:***

**Table 4.** Upper Columbia River steelhead run composition at Wells Dam (Methow and Okanogan basins) (Letter from Kirk Truscott, WDFW, July 9, 2003).

| | Artificially Propagated | | Naturally Produced | | |
|---|---|---|---|---|---|
| Year | Number | Percent | Number | Percent | Total Run |
| 1998 | 2,849 | 92% | 234 | 8% | 3,083 |
| 1999 | 3,511 | 89% | 447 | 11% | 3,958 |
| 2000 | 6,142 | 92% | 541 | 8% | 6,683 |
| 2001 | 18,034 | 95% | 889 | 5% | 18,923 |
| 2002 | 9,098 | 93% | 706 | 7% | 9,804 |

**Wenatchee and Entiat Rivers**

Between 1967 and 2003, an average of 761 naturally produced steelhead spawned in the Wenatchee River (range; 70-2,864). In the Entiat River, spawning escapement has ranged from 9 to 366, averaging 97 fish. The 12-year geometric mean of spawners in the Wenatchee River has ranged from 185 to 919, and is currently (2003) 716 (Table 8). For the Entiat River, the 12-year geometric mean has ranged from 24 to 118 and is currently 92. The returning number of fish to both tributaries is auto-correlated since they were derived from the same aggregate. Therefore, the return per spawner is reported for both populations combined. In the Wenatchee and Entiat rivers, the return per spawner has averaged 1.42 (range; 0.13-4.73) if hatchery fish produce the equivalent number of returning spawners as naturally produced fish, and averages 0.28 (range; 0.05-0.79) if hatchery fish do not produce any returning spawners. The 12-year geometric mean of the return per spawner has averaged 1.22 (range 0.71-1.96) if hatchery fish are equivalents to naturally produced fish, or 0.26 (0.18-0.32) if they do not contribute (Table 5).

**Table 5.** Summary statistics for determining naturally produced (NP) steelhead escapement and run reconstruction for the Wenatchee and Entiat Rivers

| | Stlhd. Passed | % NP | NP Escapement | | NP escpmt. | | GEO-M NP escpmt. | | Returns | | Return per spawner for Wenatchee and Entiat | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | > harvest & presp. | | | | | | | | | GEO-M | GEO-M |
| | (RI-WLS) | Wen., Ent. | <hrvst. | mortality | Wen. | Ent. | Wen. | Ent. | Wen. | Ent. | H. eff. = 0 | effect. = 1 | H. eff. = 0 | H. eff. = 1 |
| 1984 | 8,464 | 0.17 | 1463 | 919 | 683 | 87 | 220 | 28 | 1883 | 241 | 2.76 | 0.43 | 1.96 | 0.32 |
| 1985 | 12,132 | 0.21 | 2515 | 1859 | 1382 | 177 | 257 | 33 | 1406 | 180 | 1.02 | 0.19 | 1.91 | 0.32 |
| 1986 | 9,582 | 0.21 | 1967 | 1770 | 1315 | 168 | 323 | 41 | 1011 | 129 | 0.77 | 0.20 | 1.66 | 0.30 |
| 1987 | 7,239 | 0.41 | 2980 | 2682 | 1993 | 255 | 416 | 53 | 723 | 92 | 0.36 | 0.16 | 1.40 | 0.28 |
| 1988 | 4,840 | 0.33 | 1588 | 1430 | 1062 | 136 | 482 | 62 | 1125 | 144 | 1.06 | 0.36 | 1.37 | 0.29 |
| 1989 | 4,751 | 0.53 | 2507 | 2256 | 1676 | 214 | 538 | 69 | 536 | 69 | 0.32 | 0.18 | 1.31 | 0.30 |
| 1990 | 3,131 | 0.28 | 888 | 800 | 594 | 76 | 604 | 77 | 524 | 67 | 0.88 | 0.26 | 1.22 | 0.29 |
| 1991 | 3,176 | 0.49 | 1550 | 1395 | 1036 | 133 | 669 | 86 | 432 | 55 | 0.42 | 0.26 | 1.08 | 0.29 |
| 1992 | 5,451 | 0.23 | 1241 | 1117 | 830 | 106 | 761 | 97 | 485 | 62 | 0.58 | 0.15 | 0.90 | 0.25 |
| 1993 | 2,335 | 0.32 | 759 | 683 | 507 | 65 | 784 | 100 | 437 | 56 | 0.86 | 0.28 | 0.81 | 0.23 |
| 1994 | 3,457 | 0.20 | 704 | 634 | 471 | 60 | 919 | 118 | 301 | 39 | 0.64 | 0.13 | 0.79 | 0.22 |
| 1995 | 3,233 | 0.31 | 1006 | 906 | 673 | 86 | 919 | 117 | 369 | 47 | 0.55 | 0.18 | 0.71 | 0.22 |
| 1996 | 3,177 | 0.19 | 588 | 529 | 393 | 50 | 877 | 112 | 1111 | 142 | 2.82 | 0.56 | 0.71 | 0.22 |
| 1997 | 3,619 | 0.17 | 614 | 552 | 410 | 52 | 793 | 101 | 1941 | 248 | 4.73 | 0.74 | 0.81 | 0.25 |
| 1998 | 1,979 | 0.21 | 408 | 367 | 273 | 35 | 696 | 89 | | | | | | |
| 1999 | 2,765 | 0.24 | 663 | 597 | 443 | 57 | 614 | 78 | | | | | | |
| 2000 | 4,236 | 0.42 | 1789 | 1610 | 1196 | 153 | 620 | 79 | | | | | | |
| 2001 | 10,084 | 0.42 | 4284 | 3855 | 2864 | 366 | 648 | 83 | | | | | | |
| 2002 | 5,817 | 0.33 | 1931 | 1738 | 1291 | 165 | 691 | 88 | | | | | | |
| 2003 | 17,481 | 0.28 | 2375 | 2137 | 1588 | 203 | 716 | 92 | | | | | | |
| | | | | | | | | | | | | | | |
| **Avg.:** | **4,825** | **0.29** | **1,352** | **1,024** | **761** | **97** | **534** | **68** | **643** | **82** | **1.42** | **0.28** | **1.22** | **0.26** |
| **Min.:** | **1,305** | **0.14** | **196** | **94** | **70** | **9** | **185** | **24** | **110** | **14** | **0.13** | **0.05** | **0.71** | **0.18** |
| **Max.:** | **17,481** | **0.80** | **4,284** | **3,855** | **2,864** | **366** | **919** | **118** | **1,941** | **248** | **4.73** | **0.79** | **1.96** | **0.32** |

RI-WLS Rock Island dam to Wells Dam; Wen = Wenatchee, Ent = Entiat; Stlhd = Steelhead; hrvst = harvest; escpmt = escapement; Geo-M = Geometric mean; H. eff = Hatchery Effective

Data from the Upper Columbia Salmon Recovery Plan June 2005 Draft.

***UCR Spring Chinook***

**Table 6.** Estimates of the number of natural-origin spring Chinook returning to subbasins for each independent population of Upper Columbia River spring Chinook salmon and preliminary Interim Recovery Abundance and Cautionary levels.

| Year | Subbasin | | |
|---|---|---|---|
| | Wenatchee River | Entiat River | Methow River |
| 1979 | 1,154 | 241 | 554 |
| 1980 | 1,752 | 337 | 443 |
| 1981 | 1,740 | 302 | 408 |
| 1982 | 1,984 | 343 | 453 |
| 1983 | 3,610 | 296 | 747 |
| 1984 | 2,550 | 205 | 890 |
| 1985 | 4,939 | 297 | 1,035 |
| 1986 | 2,908 | 256 | 778 |
| 1987 | 2,003 | 120 | 1,497 |
| 1988 | 1,832 | 156 | 1,455 |
| 1989 | 1,503 | 54 | 1,217 |
| 1990 | 1,043 | 223 | 1,194 |
| 1991 | 604 | 62 | 586 |
| 1992 | 1,206 | 88 | 1,719 |
| 1993 | 1,127 | 265 | 1,496 |
| 1994 | 308 | 74 | 331 |
| 1995 | 50 | 6 | 33 |
| 1996 | 201 | 28 | 126 |
| 1997 | 422 | 69 | 247 |
| 1998 | 218 | 52 | 125 |
| 1999[1] | 119 | 64 | 73 |
| *2000* | *1,295* | *180* | *811* |
| 1996-2000 average | 451 | 79 | 276 |
| **Recovery Abundance** | **3,750** | **500** | **2,000** |
| **Cautionary Abundance** | **1,200** | **150** | **750** |

**[1] Estimates for 1999 are preliminary; estimates for 2000 (italics) are based on the preseason forecast (actual return data not available 10/17/00).**

**Provide the most recent 12 year (e.g. 1988-present) estimates of annual proportions of direct hatchery origin and listed natural origin fish on the natural spawning grounds, if known. Indicate sources of these data.**

***UCR Steelhead:***

**See Table 4.**

***UCR Spring Chinook:***

**Table 7.** Annual total redd counts and proportion of artificially propagated to natural origin spring Chinook salmon by tributary basin (Andrew Murdoch, WDFW, pers. comm.).

| | **Return Year** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Basin** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** |
| | | | | **Redd Count** | | | | | |
| *Wenatchee Basin* [a] | | | | | | | | | |
| Chiwawa River | 82 | 13 | 23 | 82 | 39 | 34 | 128 | 1,046 | |
| Nason Creek | 27 | 7 | 33 | 55 | 29 | 8 | 100 | 367 | |
| White River | 3 | 2 | 12 | 15 | 5 | 1 | 8 | 93 | |
| **Entiat Basin** | 34 | 13 | 20 | 37 | 24 | 27 | 73 | 202 | 112 |
| *Methow Basin* | | | | | | | | | |
| Twisp River | 32 | 4 | 0 | 32 | 0 | 7 | 99 | 370 | 109 |
| Chewuch River | 27 | 2 | 0 | 55 | 0 | 6 | 20 | 1,037 | 301 |
| Methow River | 64 | 9 | 0 | 56 | 0 | 17 | 232 | 2,828 | 722 |
| | | | | **Proportion of Hatchery to Natural Origin Spawners** [b] | | | | | |
| *Wenatchee Basin* [a] | | | | | | | | | |
| Chiwawa River | 0.40 | 0.05 | 0.43 | 0.70 | 0.56 | 0.33 | 0.56 | 0.74 | |
| Nason Creek | 0.23 | 0 | 0.33 | 0.63 | 0.19 | 0 | 0.24 | 0.61 | |
| White River | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.21 | |
| *Entiat Basin* [c] | 0 | 0 | 0.20 | ?? | 0 | 0 | 0.58 | 0.25 | 0.18 |
| **Methow Basin** | | | | | | | | | |
| Twisp River | 0 | 0 | 0 | 0.25 | 0 | 0.64 | 0.96 | 0.33 | 027 |
| Chewuch River | 0.29 | 0 | 0 | 0.33 | 0 | 0.64 | 0.42 | 0.64 | 087 |
| Methow River | .014 | 0 | 0 | 0.37 | 0 | 0.39 | 0.91 | 0.95 | 0.95 |

[a] *Areas upstream of Tumwater Dam*

[b] *Based on coded-wire tag recoveries*

[c] *Minimum values, some carcasses were of unknown origin*

### 2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

**Trapping Operations:** The collection of broodstock through trapping operations at Tumwater Dam for Wenatchee sockeye salmon may lead to the indirect take of co-migrating listed species, including Upper Columbia River ESU steelhead, Upper Columbia River ESU spring Chinook, and Columbia River population segment bull trout. Indirect takes of these listed species at this trap is authorized through Section 10 direct take permits #1395 (steelhead) and # 1395 (spring Chinook), and under a Section 6 cooperative management agreement with the USFWS (bull trout). Incidental take from collecting sockeye salmon are covered under permit 1347. The Tumwater Trap will be operated 16 hours per day, three days per week from early June through mid-November each year. Downstream migrating fish can pass the trapping operation freely. Frequent monitoring and operation of the trap minimizes the risk of fish loss. Water loss is not a potential risk factor, as the ladder where the fish are trapped is supplied directly by the Wenatchee River at the head of Tumwater Dam.

**Genetic and Ecological Effects on Natural Populations:**
The genetic risks to naturally produced populations from artificial propagation include reduction in the genetic variability (diversity) among and within populations, genetic drift, selection, and domestication which can contribute to a loss of fitness for the natural populations (Hard *et al.*1992; Cuenco *et al.* 1993; NRC 1996; and Waples 1996). Broodstock protocols for the sockeye program does not allow more than 10% of the broodstock collection to be of hatchery origin. This level of integration (90% +) results in natural fitness incorporated into the gene pool therefore driving the natural adaptation of the population and reducing hatchery influence.

**Disease interactions** The Columbia River watershed is a single "Fish Health Management Zone" under the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998), and transfers of salmon within the same zone are allowed from a fish disease management perspective. The proposed artificial propagation program will be operated to comply with these guidelines. In addition, fish health protocols will be followed in accordance with Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) and Integrated Hatchery Operations Team (IHOT 1995) guidelines for all programs. To reduce the likelihood for the amplification of fish disease, the incidence of viral pathogens in all salmon broodstocks is determined by sampling fish at spawning in accordance with procedures set forth in the above documents. Fish health and condition would be monitored routinely during rearing by fish health professionals for each proposed program. Additionally, juvenile fish undergo fish health sampling prior to transfers between facilities and prior to release into the natural environment. NMFS finds that implementation of these guidelines is sufficient to minimize the risk of fish disease amplification through hatchery spawning practices, and disease transmission to listed adult fish outside of the hatcheries.

**Competition:**
Direct competition for food and space between hatchery and natural fish may occur in spawning and/or rearing areas, the migration corridor, and in ocean habitat. These impacts are assumed to be greatest in the spawning and nursery areas and at points of highest fish density (release areas) and to diminish as hatchery smolts disperse (USFWS 1994). Competition continues to occur at some unknown, but probably lower, level as smolts move downstream through the migration corridor (NMFS 1995). Release of large numbers of pre-smolts in a small area is believed to have greater potential for competitive effects because of the extended period of interaction between hatchery fish and natural fish. Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate out of the spawning and rearing areas. Rearing and release strategies are designed to limit the amount of ecological interactions

occurring between hatchery and naturally produced fish. Fish are reared to sufficient size such that smoltification occurs within nearly the entire population, which reduces retention time in the streams after release (Bugert et al. 1991). Rearing on parent river water, or acclimation for several weeks to parent river water, also contributes to the smoltification process and reduced retention time in the streams. Adult hatchery fish that stray to natural spawning areas, rather than return to the hatchery, may also be competing for spawning gravel. However, when spawning populations are at depressed levels, the degree of this impact should be small: there is thought to be a relationship between high spawner density and greater egg loss in the natural environment (Chebanov 1991). Stray hatchery adults may also breed with native fish, potentially altering genetic fitness and influencing their ability to survive in the ecosystem. As an integrated program, hatchery spawners can add to the escapement needed in the system.

**Predation, cannibalism, and residualism:**
Predation by hatchery fish on natural-origin smolts is less likely to occur than predation on fry. The USFWS (1994) presented information indicating salmonid predators are generally thought to prey on fish approximately 1/3 or less their own length (see also Witty *et al.* (1995) citing Parkinson *et al.* (1989)). Consequently, predation by hatchery fish on listed salmon smolts in the migration corridor is believed to be low. Large numbers of artificially propagated steelhead may attract predators (birds, fish, pinnipeds) and, consequently, contribute indirectly to predation of naturally produced fish. On the other hand, a mass of hatchery fish moving through an area may confuse or distract predators and may provide a beneficial effect to naturally produced fish. Both effects may be occurring to some extent. The presence of large numbers of hatchery fish may also alter the listed species' behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994). Impacts from predation by hatchery-produced sockeye are not likely to be a substantial risk to ESA-listed naturally produced populations because of their size at release, food preferences and because they tend to migrate out of the basin quickly.

**Residualism:**
WDFW will release only smolts with demonstrated readiness for seaward migration. Smolt releases can also be timed with water budget releases from upstream dams to further accelerate rapid downstream movement (WDFW 1997). Juveniles move downstream from the rivers to Lake Wenatchee immediately after they emerge from the gravel (March through May). Most of the juveniles (about 82%) spend one year in Lake Wenatchee (Shaklee et al. 1996), yet some spend two years in the lake prior to emigration. A small percentage of sockeye salmon remain in Lake Wenatchee their entire life landlocked as kokanee.

**Migration Corridor/Ocean:**
Hatchery and natural populations have similar ecological requirements and can potentially be competitors where critical resources are in short supply (LGMSC 1993). The artificial propagation programs will be managed to produce sockeye ready for seaward migration. Proposed maximum production for these facilities is the same as when the Columbia basin annual production ceiling was established in 1995 (NMFS 1995; WDFW 1997). The Columbia basin annual production ceiling was based on the information on the effects of hatchery fish on listed fish in the migration corridor and ocean. Reviews of the potential effects of hatchery fish in the migration corridor and ocean are provided by Hard (1994), NMFS (1995) and CBFWA (1996). Currently, the only way to address potential ecological interactions between hatchery and natural fish in the Columbia River basin is through the production ceiling (NMFS 1995), which limits the number of hatchery fish released into the basin. A total of about 72 million anadromous salmonid smolts are released from artificial propagation programs annually. The effects of the releases from Priest Rapids cannot be separated from all other smolt releases, nor can the effects of the entire release be determined at this time. NMFS concludes that the production ceiling protects ESA listed species and finds that based on the best available information of adverse impacts in the migration corridor and ocean that the proposed

programs have only minor transitory effects.

**Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**

Take Description and Levels are covered under Incidental Take Permit 1347 (artificial propagation of unlisted salmon). Incidental takes of ESA-listed species associated with broodstock collection activities, hatchery operations, and juvenile fish releases from the program are authorized for unlisted salmon propagation program activities including:

- The collection of broodstock through trapping operations at Tumwater Dam for Wenatchee sockeye salmon.
- The holding and artificial spawning of collected adults at Eastbank Hatcheryand Priest Lake Wenatchee Net Pens.
- The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Eastbank Hatchery complex facilities.
- The transfer of sockeye salmon fingerlings or pre-smolts from the hatchery for rearing at net-pens in Lake Wenatchee.
- The release of sockeye salmon smolts into the WenatcheeRiver basin from the hatcheries, acclimation ponds, and net-pens within this system.
- The monitoring and evaluation of is artificial propagation program in the natural environment through activities such as redd counts and carcass surveys, and formal monitoring and evaluation plans to be developed by the HCP Hatchery Committees as called for in the HCPs

Because of the inherent biological attributes of aquatic species, such as salmon and steelhead, the dimensions and variability of the Columbia River system and tributaries, and the operational complexities of hatchery actions, determining precise incidental take levels of ESA-listed species attributable to the hatchery activities is not possible at present. The existence of concurrent WDFW broodstock collection programs for listed steelhead at Wells Dam, Dryden Dam, and Tumwater Dam (previously authorized by NMFS through Section 10 direct take Permit #1395), and for listed spring Chinook salmon at Tumwater Dam (previously authorized by NMFS through Section 10 direct take Permit #1196), further complicates the ability to identify incidental take occurring through the unlisted salmon programs. Indirect takes from hatchery releases such as predation and competition is highly uncertain and dependent on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities.

**Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.**
Any additional mortality from this operation that deviates from permit conditions or take levels would be communicated to NOAA Fisheries per permit conditions (#1395 and #1196).

**Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.
Annual Progress Reports as a condition of Section 10 permit compliance are provided from WDFW to NOAA Fisheries for past takes associated with the Section 10 permit (#1395 and # 1196).

# Section 3: Relationship of Program to Other Management Objectives

## 3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. Hood Canal Summer Chum Conservation Initiative) or other regionally accepted policies (e.g. the NPPC Annual Production Review Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

The artificial propagation activities of this program are included within the MCMCP, a conservation planning initiative in the mid-Columbia River Basin designed to bolster the productivity of salmonid populations in a manner that is compatible with self-sustaining populations. The MCMCP includes approaches for hatchery production that will contribute to the rebuilding and recovery of naturally spawning stocks throughout the Mid-Columbia region to the point that those stocks can be self-sustaining, supporting harvest, while maintaining genetic and ecologic integrity (MCMCP 1998). A Biological Assessment and Management Plan (BAMP) has been assembled as a part of the MCMCP that describes approaches to be applied within the region under a Mid-Columbia River Hatchery Program. This program is a consensus plan by fish co-managers for development, operation, and evaluation of anadromous salmonid hatcheries in the Columbia River upstream of the Yakima River confluence (BAMP 1998). The co-managers include National Marine Fisheries Service (NMFS), U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Yakama Indian Nation, Colville Confederated Tribes, the Confederated Umatilla Tribes, and Chelan, Douglas, and Grant Public Utility Districts (PUDs).

The hatchery program is part of an application for the 50-year multi-species MCMCP and relicensing agreement for the PUDs. The plan has two objectives: (1) to help recover natural populations throughout the Mid-Columbia Region so that they can be self-sustaining and harvestable, while maintaining their genetic and ecologic integrity; and (2) to compensate for the mortality rate at each of the five PUD-owned mid-Columbia River mainstem dams (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) in a manner that is consistent with the first objective. The first objective (recover populations that are at risk of extinction) takes precedence, and will guide the strategies used in the initial years of the hatchery program. Once it appears that populations have recovered, and if it can be done in a manner that will not jeopardize them, hatchery production of these populations will increase to meet the second objective (compensation for hydropower-related mortalities).

The program described in this HGMP is consistent with the following general agreements and plans:

- The Columbia River Fish Management Plan (CRFMP)
- *U.S. vs. Oregon* court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife (WDFW) Wild Salmonid Policy
- WDFW's Yearly Future Brood Document (FBD)

## 3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Artificial production in the Columbia Cascade Province has been primarily driven by mitigation agreements with Douglas County, Chelan County, and Grant County Public Utility Districts, and the Grand Coulee Mitigation Agreement of the U.S. Bureau of Reclamation. The Columbia River Fish Management Plan arising from the US v. Oregon process includes hatchery programs, but this plan has expired and is no longer in force.

In April 2002, negotiations on three Habitat Conservation Plans (HCPs) were concluded pursuant to section 10(a)(1)(B) of the ESA; *Anadromous Fish Agreement and Habitat Conservation Plan Wells Hydroelectric Project FERC1 License No. 2149* with Douglas PUD for the operation of Wells Dam (DPUD 2002), and *Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project FERC License No. 2145* (CPUD 2002a) with Chelan PUD for the operation of Rocky Reach Dam, and *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b). Biological Opinions with incidental take statements (ITSs) on the operation of each of the above hydroprojects have been issued consistent with the HCPs (NMFS 2003a, 2003b, 2003c).

The supplementation program, and the HGMP describing it, are consistent with the following agreements or plans:

- Upper Columbia River Steelhead Management Plan. Fishery management objectives within the UCRSMP and HGMP are consistent.
- The Upper Columbia Salmon Recovery Board (UCSRB and the Regional Technical Committee (RTT): The UCSRB is a partnership among Chelan, Douglas, and Okanogan counties, the Yakama Nation, and the Confederated Tribes of the Colville Indian Reservation in cooperation with local, state, and federal partners. The mission of the UCSRB is *to restore viable and sustainable populations of salmon, steelhead, and other at-risk species through the collaborative efforts, combined resources, and wise resource management of the Upper Columbia Region.* To better meet its mission, the UCSRB wishes to ensure that actions taken to protect and restore salmonid habitat in the region are based on sound scientific principles.
- Northwest Power Planning Council 2000 Fish and Wildlife Program. The proposed hatchery program is consistent with the Vision, Goals, Objectives, and Strategies of the 2000 Fish and Wildlife Program as well as the Okanogan Subbasin Summary created under the Fish and Wildlife Program.
- National Marine Fisheries Service Biological Opinion for Operation of the Federal Columbia River Power System. The work to be conducted under this HGMP is consistent with several Reasonable and Prudent Alternatives as described in the BiOp for the FCRPS (109, 169, 171).
- Mid-Columbia River Habitat Conservation Plan. The HCP indicates that the preferred strategy for the Okanogan River steelhead program is to develop a local population for broodstock to promote local adaptation. The proposed work intends to accomplish this program reform.

## 3.3 Relationship to harvest objectives.

Wenatchee sockeye have been harvested incidentally in lower Columbia river fisheries directed at other species. Non-Indian and treaty Indian commercial fisheries for sockeye could occur when the escapement goal of 75,000 at Bonneville Dam has been achieved and sufficient surplus is available for fisheries. Commercial harvest of sockeye has not occurred since 1988 except for small fisheries in 2000 and 2004. Last year, over 123,000 sockeye were counted at Bonneville Dam. The 2005 preseason forecast for sockeye in the Columbia River is for a return of 70,800 fish, including less than 100 sockeye destined for Redfish Lake in Idaho. The popular Lake Wenatchee sockeye sport fishery is dependent upon escapement levels back to the Wenatchee River system.

### 3.3.1 Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years if available.

**Wenatchee Sockeye**

Directed sport fisheries in Lake Wenatchee have been allowed in years when the escapement goal of 27,000 was expected to be met or exceeded. Past harvest rates for Lake Wenatchee can be estimated as follows: total sockeye run size estimates for fish passing Bonneville Dam and lower river sockeye harvest estimates can be used to estimate lower river sockeye exploitation rates, and Tumwater Dam sockeye counts can be compared with Lake Wenatchee sport catch estimates for the total Wenatchee sockeye run. Recreational fishing opportunity for sockeye in Lake Wenatchee is dependent on having harvestable runs. Recreational fisheries for sockeye occurred in Lake Wenatchee during the 1980s and early 1990s, and most recently during the 2001 and 2004 seasons (Table 8). The fishery would typically open in early August and remain open until the harvestable surplus was taken. The escapement goal at Priest Rapids Dam is 65,000 sockeye. Turn-off into Lake Wenatchee is measured by subtracting the Rocky Reach Dam count from the Rock Island Dam count. On average 50% of the sockeye run has crossed Rock Island Dam by about July 13 and Rocky Reach Dam by July 17. Although no escapement goal is formally established for the Wenatchee system, the past objectives were to have 23,000 fish reach the spawning grounds after fisheries. Based on harvest estimates of prior years, it is expected that a fishery in Lake Wenatchee would harvest about 16% of the Wenatchee River run. Therefore, a return of about 27,000 sockeye in the Wenatchee component would be required before opening a sport fishery.

**Table 8. Lake Wenatchee sockeye catches since 1984.** Blank field indicates escapement was not sufficient to allow a fishery for that year.

| YEAR | Sockeye Catch | YEAR | Sockeye Catch |
|---|---|---|---|
| 1984 | 1,350 | 1995 | |
| 1985 | | 1996 | |
| 1986 | | 1997 | |
| 1987 | | 1998 | |
| 1988 | | 1999 | |
| 1989 | | 2000 | |
| 1990 | 6,523 | 2001 | 3,265 |
| 1991 | 6,232 | 2002 | |
| 1992 | 3,556 | 2003 | |
| 1993 | 6,069 | 2004 | 5,410* |
| 1994 | | | |

* Estimated catch (429 AD Clipped)

Data is from the WDFW historical freshwater sport catch record card database.

## 3.4 Relationship to habitat protection and recovery strategies.

WDFW is a cooperating agency involved in regional fish and wildlife planning and technical assistance effort through the Upper Columbia Salmon Recovery Board (UCSRB). The mission of the UCSRB is to restore viable and sustainable populations of salmon, steelhead, and other at-risk species through the collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia Region. Along with Chelan, Douglas, and Okanogan counties, the Yakama Nation, and Colville Confederated Tribe, local, state, and federal partners, agency staff will be working closely in partnership with existing planning efforts in the region including Wenatchee Watershed Planning, Entiat Watershed Planning, Lead Entities, Regional Fisheries Enhancement Group, and Salmon Recovery Planning.

Six fish and wildlife plans (also known as "subbasin plans") have been be developed for the following "subbasins" (commonly known as watersheds): Wenatchee, Entiat, Lake Chelan, Methow, Okanogan, and the mainstem Columbia River from Rock Island dam to the Canadian border. Subbasin plans have been submitted to the Northwest Power Planning Council in May 2004. These subbasin plans will identify and provide the basis for prioritizing project proposals to be submitted to the Northwest Power Planning Council in future funding cycles and will be used, potentially, for salmon recovery planning in North Central Washington.

WDFW helps ensures that actions taken to protect and restore salmonid habitat in the region are based on sound scientific principles thru technical assistance of Regional staff. In addition to habitat, WDFW is involved with the Yakama Nation and Colville Confederated Tribes in helping develop recovery goals, and providing coordination and representation for all 4 H's (Harvest, Hydro, Hatcheries and Habitat). At the watershed scale, technical tools such as Limiting Factors Analysis (LFA), Ecosystem Diagnosis and Treatment (EDT) and SSHIAP (Salmon and Steelhead Inventory and Assessment Program) will used to identify factors that currently impact salmon and the priority actions needed in the watershed.

Production of Wenatchee sockeye salmon is primarily limited by oligotrophic conditions in Lake Wenatchee (sole rearing lake)(BAMP 1998). Lake Wenatchee is reported to be one of the least productive sockeye rearing lakes in North America (Allen and Meekin 1980), yet the habitat and migration conditions are generally considered good in this basin (Mullen 1986, BAMP 1998). NMFs expressed concerns about effects of hydropower development in the Columbia River on the health of Wenatchee sockeye (Gustafson et al. 1997). The main freshwater habitat problem currently facing this ESU is hydropower dams in the mainstem Columbia River, which probably reduce returns of sockeye salmon (Chapman et al. 1995). Measure taken by the Mid Columbia PUDs to improve natural production of anadromous fish in the region will compensate for mortality in project and reservoir passage. Two strategies will be used: (1) habitat protection and restoration, and (2) hatchery production of affected species in the mainstem Columbia River and in the four major tributaries, including the Wenatchee River.

Bugert et al. (1997) maintain that the spawning habitat for the Wenatchee population is highly susceptible to degradation or loss. This may greatly affect the viability of naturally produced sockeye salmon. In the Wenatchee Watershed, most sockeye spawn in the lower 15 km of the White River, which is vulnerable to housing development. Bugert et al. (1997) identified this as the single most important habitat to protect within the Wenatchee Watershed.

The supplementation program for Wenatchee sockeye salmon is based on the premise that current stock productivity has a major limiting factor because of low spring zooplankton production in Lake Wenatchee (BAMP 1998). Mullan (1996) hypothesized that low zooplankton densities limited growth and survival of sockeye fry in Lake Wenatchee from fry emergence through early summer, particularly in years with high snow accumulations and resultant nutrient flushing from the lake.

The existing population and proposed additional production is designed to circumvent this bottleneck by providing rearing in net pens until fall or late summer, when zooplankton densities are much higher. This strategy is based on the concept that release of juveniles in the late summer to fall will not reduce survival of naturally produced sockeye rearing in the lake because food is abundant in late summer and winter survival is probably not density dependent.

Habitat protection efforts, combined with production from the sockeye supplementation program, are expected to benefit natural sockeye production over the short-term and long-term. Improvements in dam passage survival rates, and circumvention of the bottlenecks to productivity afforded by the sockeye supplementation program will be used to boost the populations to a level approaching or exceeding 32,000 adults.

## 3.5 Ecological interactions.

*Salmonid and non-salmonid fishes or other species that could:*
*(1) negatively impact program;*
Most sockeye salmon emigrate from Lake Wenatchee as smolts in spring (French and Wahle 1959; Mullan 1986). Competition for food may play a role in the mortality of juvenile sockeye (Mullan 1986). Predation also limits production of sockeye salmon (Beauchamp et al. 1995; Wahle et al. 1979; Thompson and Tufts 1967). Chapman et al. (1994) suggest that the low productivity of Lake Wenatchee may increase the vulnerability of juvenile sockeye salmon to predation. Wild-origin bull trout indigenous to the Wenatchee Basin pose a predation risk to natural and hatchery-origin sockeye (BAMP 1998). Due to their relatively large size, natural and hatchery-origin steelhead, spring Chinook, and coho salmon yearlings may also pose a predation risk to rearing and migrating sockeye juveniles, in the Wenatchee Basin and in the Columbia mainstem. SIWG (1984) reported a high risk that freshwater predation by coho, Chinook, cutthroat trout, steelhead, and bull trout will have a significant negative impact on the productivity of enhanced sockeye populations. A high predation risk ranking was also assigned for northern pike minnow, coastrange sculpin, and prickly sculpin (SIWG 1984). Threespine stickleback were determined to pose a high risk of adverse competitive effects on enhanced sockeye.

*(2) be negatively impacted by program*;
SIWG (1984) reported that there is a low risk that enhanced sockeye populations would be impacted by competition. Large concentrations of migrating hatchery sockeye may attract predators (birds, fish, and seals) and consequently contribute indirectly to predation of listed wild fish (Steward and Bjornn 1990). The presence of large numbers of hatchery fish may also alter wild sockeye behavioral patterns, potentially influencing their vulnerability and susceptibility to predation.

*(3) positively impact program;*
Increased numbers of spring Chinook, steelhead, and bull trout that escape to spawn in tributaries to Lake Wenatchee may contribute nutrients to the lake upon dying that would benefit sockeye productivity.

*(4) be positively impacted by program.*
Sockeye released from the Wenatchee net-pens may benefit co-occurring salmonid populations. A mass of hatchery fish migrating through an area may overwhelm established predator populations, providing a beneficial, protective effect to co-occurring wild fish.

# Section 4. Water Source

## 4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile and natural limitations to production attributable to the water source.

Adult sockeye used as broodstock in the supplementation program are captured at Tumwater Dam on the Wenatchee River, which is the home water source for the target population. Eastbank Hatchery uses well water at a volume of up to 10 cfs for the salmon rearing operation. The quality of well water used by the hatchery is high, and adequate to ensure the health of salmonids propagated. Eastbank Hatchery has four wells that supply 53 cfs, from an aquifer, with a temperature range of 7.8 C in May to 13.9 C in December. The rearing conditions at Eastbank FH (as well as its acclimation ponds) are designed on loading densities recommended by Piper et al. (1982; 6 lb/gpm and 0.75 lb/ft) and Banks (1994; 0.125 lb/ft /in).

Captured adult fish, and fingerling fish reared to smolt size for release, are held in net-pens in Lake Wenatchee, which is the sole water body used for adult holding and juvenile rearing by the natural sockeye population. Fish are reared in ambient lake water temperature which is 13°C - 17°C during the early summer but increases to 21 $^{o}$C by late summer and early fall necessitating the release of the program from the net pens. Warm summer temperatures can exasperate the fish health of both juveniles and adults sockeye held at the net pens. The Lake Wenatchee Net Pens rely on passive flow, and do not withdraw water.

## 4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Adverse impacts on listed fish due to the operation of hatchery facilities for the propagation of unlisted species may occur because of river water intake placement, or design, or operation including blocked migration, de-watering river reaches or reduced stream flow, and entrainment from unscreened or improperly screened intakes. Effluent from hatchery facilities may decrease quality through changes in water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the receiving streams mixing zone (Kendra 1991). Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State chapter 90.03 Revised Code of Washington (RCW) water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing.

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State chapter 90.03 Revised Code of Washington (RCW) water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. In the Wenatchee River basin, all of the water intake systems at hatchery facilities that have surface water intakes are screened in compliance with NMFS screening criteria (NMFS 1996), except for the USFWS' Leavenworth NFH (Biological Opinion for Permit 1347).

In the mainstem Columbia River, Eastbank Hatchery does not use any surface water, so no intake structures are associated with these operations, and no intake screening that may lead to listed juvenile fish injury through entrainment exists. Juvenile fish screening for the water intake systems at Wells Hatchery and Priest Rapids Hatchery are not in compliance with NMFS screening criteria (NMFS 1996). The facilities were built prior to the establishment of NMFS criteria. Douglas PUD is committed to be in compliance by November 2005 (Shane Bickford, pers. com., October 1, 2003).

Routine intake screen inspections and upgrading to current screening criteria when existing screens fail are conditions which will be included in permit 1347. Without these conditions, water intakes for the hatchery may adversely affect listed spring Chinook and steelhead juveniles through entrainment. Application of the conditions to the operation of these hatcheries through this Opinion will help ensure that the effects of the hatchery intakes on listed fish are adequately minimized.

All WDFW hatcheries monitor their discharge in accordance with the National Pollutant Discharge Elimination System (NPDES) permit. This permit is administered in Washington by the Washington Department of Ecology under agreement with the United States Environmental Protection Agency. The permit was renewed effective June 1, 2000 and will expire June 1, 2005. Hatchery wastewater discharge is monitored monthly at each of the facilities in the Upper Columbia basin. The production from the Lake Wenatchee Net Pens falls below the minimum production requirement for an NPDES permit, but the facility operates in compliance with state or federal regulations for discharge and meets the guidelines that do not require the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).

# Section 5. Facilities

## 5.1 Broodstock collection facilities (or methods).

The Tumwater Dam trap is situated at the top of the fish ladder circumventing Tumwater Dam on the left bank of the Wenatchee River. Fish are trapped through closure of a gate at the top of the trap, which prevents upstream passage, maintaining the fish in a 10' x 50' x 8' deep holding pond. The pond lacks a "V" entry, and fish are therefore not prevented from returning to downstream areas. The trap is actively run, with fish allowed to exit the pond upstream via a *Denil* ladder shunted into a 4' x 4' holding box for immediate loading into a tanker truck. The fish may also be passed into the dam forebay in this manner. Collected fish will be identified by species and as of wild or hatchery-origin if visible marks enable identification. Fish are transported to the Lake Wenatchee net-pens.

## 5.2 Fish transportation equipment (description of pen, tank, truck, or container used).

The following tankers are used in adult transport.

| Equip. Type | Capacity (gallons) | Supp. Oxygen (y/n) | Temp. Control (y/n) | Norm. Transit Time (minutes) | Chemical(s) Used | Dosage (ppm) |
|---|---|---|---|---|---|---|
| Flatbed Truck with Tank (adult hauling) | 250 | Y | N | 15 | MS 222 and NaCl | 10 ppm (MS 222) and 0.5-1.0% (NaCl) |
| Tanker Truck | 2500 | Y | N | 45 | MS 220 and NaCl | 0.5-1.0% (NaCl) |

## 5.3 Broodstock holding and spawning facilities.

Sockeye trapped at Tumwater Dam are transported to the Lake Wenatchee net-pens and held in two net pens until maturity, and spawned at the net-pen site. At Lake Wenatchee, there are six floating net pens for juvenile rearing (about 20 x 20 x 20 ft) and two adult holding pens (about 16 x 16 x 20). The pens are located on the west end of the lake near the mouths of Little Wenatchee and White rivers. After the sockeye are spawned at the net pen site, unfertilized gametes are transported to Eastbank Hatchery for fertilization and incubation.

| Ponds (No.) | Pond Type | Volume (cu.ft) | Length (ft.) | Width (ft.) | Depth (ft.) | Available Flow (gpm) |
|---|---|---|---|---|---|---|
| 6 | Net Pens | 7400 | 20 | 20 | 20 | No direct flow |
| 2 | Net Pens | 5,120 | 16 | 16 | 20 | No direct flow |

## 5.4 Incubation facilities.

After transport to Eastbank hatchery, eggs are fertilized are placed in Heath Incubators. Up to 8 halfstacks can be used for the sockeye program.

| Incubator Type | Units (number) | Flow (gpm) | Volume (cu.ft.) | Loading-Eyeing (eggs/unit) | Loading-Hatching (eggs/unit) |
|---|---|---|---|---|---|
| Heath Stacked Tray (104 half stack units with 7 trays per Stack) | 104 | 3-4 | - | 7,000 (3 females/tray) | 8,000 |

## 5.5 Rearing facilities.

| Ponds (No.) | Pond Type | Volume (cu.ft) | Length (ft.) | Width (ft.) | Depth (ft.) | Flow (gpm) | Max. Flow Index | Max. Density Index |
|---|---|---|---|---|---|---|---|---|
| 4 | Fiberglass Troughs (Eastbank Hatchery Rearing Phase) | 32 | 20 | 1.75 | 0.92 | 12-15 | | 0.125 |
| 2 | Standard concrete raceways | 3,500 | 100 | 10 | 3.5 | 1,126 | | 0.125 |
| 8 | Net Pens (Lake Wenatchee Rearing Phase) | 1,900 | 20 | 20 | 20 | | | 0.20 |

## 5.6 Acclimation/release facilities.

Historically fish were transferred to the Lake Wenatchee net-pens as unfed fry in early April but the program has changed to not transferring fish until 100 ffp. This has decreased operational problems at the pen site and has resulted in better survival. Until liberation in late summer to mid-fall, fish have been acclimated to Lake Wenatchee for approximately 2-4 months in the existing net pens. Fish will over-winter before emigrating downstream in the spring.

## 5.7 Describe operational difficulties or disasters that led to significant fish mortality.

The surface temperature profile of Lake Wenatchee during the adult holding period (July through mid-October) exposes adults to temperatures in excess of 21 $^{o}$C during their maturation period. In extreme years (e.g., 1998), high water temperatures resulted in high adult mortality (33%) due to *Columnaris* and subsequent low fertilization rates (Tonseth et al. 2002).

## 5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Sockeye are incubated to swim-up at Eastbank Hatchery. This is one of many programs at Eastbank Hatchery including listed fish handled at the hatchery. Sockeye, like listed stocks are protected by multiple incubation and rearing units, 24/7 security and water alarm features. Backup systems are in place if needed. Disease protocols are followed to segregate stocks and are monitored daily for any problems.

# Section 6. Broodstock Origin and Identity

### 6.1 Source.

Broodstock used in the program are trapped from the run at large reaching Tumwater Dam. These fish originated from Little Wenatchee or White River sockeye broodstock of natural or hatchery-origin, and represent the indigenous population.

### 6.2.1 History.

Broodstock used in the supplementation program since 1989 originated from natural spawners from the White and Little Wenatchee rivers. Sockeye salmon originating in these two rivers are likely the descendants of stock manipulations during the Grand Coulee Fish Maintenance Program, since Wenatchee sockeye were extremely depressed in number prior to the construction of Grand Coulee Dam (Gustafson et al. 1997). The existing hatchery program was founded in 1989 through the collection of returning sockeye from the run at large at Tumwater Dam to supplement the natural Wenatchee population. No other broodstock sources have been used since that time.

| Broodstock Source | Origin | Year(s) Used | |
|---|---|---|---|
| | | Begin | End |
| Little Wenatchee and White River Sockeye | N | 1989 | U |

### 6.2.2 Annual size.

The current annual program broodstock collection goal is 260 fish, equally divided by sex. Future production alternatives specified in the Mid-Columbia Hatchery Plan (BAMP 1998) will necessitate the annual collection of approximately 950 fish (1:1 sex ratio) to meet sockeye smolt production objectives. Currently though, the collection of only 260 sockeye from the run at large for use as broodstock is not expected to adversely affect the population status of the natural population relative to critical and viable thresholds. The supplementation program is designed to increase the population size to counter natural bottlenecks to the productivity of the natural Wenatchee sockeye run.

### 6.2.3 Past and proposed level of natural fish in the broodstock.

Broodstock used in the sockeye supplementation program are secured from the run-at large encountered through trapping in the Wenatchee River at Tumwater Dam. Beginning with the 1990 brood, all sockeye released through the program were externally marked, allowing for differentiation between natural and hatchery origin adults. The broodstock will include less than 10% hatchery fish in any one year, and less than 10% of the overall run will be collected for broodstock (BAMP 1998). In the event the projected run size is below 3,000 fish, the broodstock goal will be reduced proportionately. WDFW proposes to develop annual broodstock collection goals and protocols prior to the arrival of the adults each year to allow for consideration of run size, run composition in terms of sex, age, and natural to hatchery components with the following sideboards (WDFW 1999c; 2000):

- Retain broodstock from the Wenatchee River run at large at Tumwater Dam from July 15 through early August;
- Actively operated three days a week for eight hours per day;
- The broodstock collection goal is approximately 260 adults;
- To maintain the genetic integrity of the artificially propagated population, limit the number of adipose fin-clipped adult sockeye salmon used for broodstock to 10 percent or less of the total collection;

- To reduce the risk of adverse genetic effects on the founding natural population, the total collection is limited to 10 percent of the total run (WDFW 1999c).

### 6.2.4 Genetic or ecological differences.

Over 23 million Lake Whatcom kokanee were released in Lake Wenatchee between 1934 and 1983; however, the current genetic make-up of the Lake Wenatchee sockeye salmon population reveals little or no affinity with Lake Whatcom kokanee (NOAA-NMFS-NWFSC TM-33: Sockeye Salmon Status Review). There are no known genotypic, phenotypic, or behavioral differences between the hatchery stocks and natural stocks in the target area.

### 6.2.5 Reasons for choosing.

Sockeye collected as adults and spawned, and the progeny propagated through the program, represent the indigenous Wenatchee Basin sockeye population, which is the target of the supplementation program. This population of sockeye currently provides harvest to downstream fishers in the Columbia River, and supplementation of the populations will facilitate enhancement of population and associated future harvest.

## 6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Sockeye are not listed, but based on Permit 1347, trapping operations at Tumwater Dam applies measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. WDFW shall carefully handle and immediately release upstream incidentally captured listed steelhead andUCR spring Chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs.

# Section 7. Broodstock Collection

## 7.1 Life-history stage to be collected (adults, eggs, or juveniles).

Adult sockeye salmon are to be collected at Tumwater Dam for use as broodstock.

## 7.2 Collection or sampling design

Sockeye salmon broodstock are collected each year from the run at large reaching Tumwater Dam, located at Rkm 52.0 on the Wenatchee River during the months of July and early August. Fish are collected using a trap positioned at the top of the fish ladder, which is located on the left bank of the river. The trap will be operated three days per week during the sockeye collection period each year. The trap will be in active operation 16 hours per day during the three days per week that it will be open. Fish are trapped through closure of a gate at the top of the trap, which prevents upstream passage, maintaining the fish in a 10' x 50' x 8' deep holding pond. The pond lacks a "V" entry, and fish are therefore not prevented from returning to downstream areas. The trap is actively run, with fish allowed to exit the pond upstream via a *Denil* ladder shunted into a 4' x 4' holding box for immediate loading into a tanker truck. The fish may also be passed into the dam forebay in this manner. Collected fish will be identified by species and as of wild or hatchery-origin.

When operating, the trap is able to collect 100 % of the sockeye migration arriving at Tumwater Dam. The sockeye have no alternatives to bypass the dam other than the fish ladder. The collection of approximately 260 adult sockeye each year for use as broodstock leads to the removal of 0.9 % to 2.16 % (mean = 1.29 %, s.d. = 0.51 %) of the total estimated run arriving at Tumwater Falls (1989-93 brood year collection data from Eltrich et al. 1995 and Petersen et al. 1997). Measures to reduce sources of bias that could lead to a non-representative sample of the desired brood stock source include trapping all fish from the middle 80th percentile of the run at large and collection of fish randomly during the peak of passage to ensure proportional representation of the age and size structure of the returning population. An additional measure employed to reduce the risk of adverse genetic effects to the population is the 10% ceiling on inclusion of marked (hatchery-origin) sockeye in the broodstock.

Draft adult broodstock collection protocols such as those outlined below (2003-04) are keyed on target numbers at various collection sites operated by WDFW that provide broodstock for Mid-Columbia PUD mitigation program facilities. Adult broodstock collection protocols are to be considered an interim and dynamic hatchery broodstock collection plan, which may be altered following joint fishery party (JFP) discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

**Lake Wenatchee sockeye program and assumptions:**

| | |
|---|---|
| R.I. Settlement Program | 200,000 fall release sub yearlings |
| Propagation survival | 79% fertilization to release |
| Fecundity | 2,340 eggs per female |
| Female to male ratio | 1 to 1 |
| Pre-spawn survival | 85% |
| Broodstock required | 260 |

Trap 260 wild sockeye proportional to run timing at Tumwater Dam. Due to unequal sex ratio in previous years, attempts should be made to collect an equal number of males and females. Protocol includes the following guidelines:

- Trap all fish from the middle 80th percentile of the run at large;

- Begin trapping a minimum of eight days after the peak passage of sockeye is recorded at Rock Island Dam or after July 15, which ever comes first; and
- Randomly collect up to 260 adult sockeye during the peak of passage to ensure proportional representation of the age and size structure of the returning population. Broodstock collections will not exceed 10% of the expected run.
- Marked (hatchery-origin) sockeye salmon will not exceed 10% of the broodstock.

## 7.3 Identity.

The target population is the Lake Wenatchee sockeye ESU. No other sockeye population is present in the project area. Broodstock are collected from the run at large. Beginning with the 1990 brood, all sockeye released from the program have external marks, enabling recognition of adults upon return as of hatchery or natural origin.

## 7.4 Proposed number to be collected:

### 7.4.1 Program goal (assuming 1:1 sex ratio for adults):

260 adults at a 1:1 male to female ratio over the course of the run.

**7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.**

| Year | Adults | | |
|---|---|---|---|
| | Females | Males | Jacks |
| Planned | 130 | 130 | none |
| 1990 | 150 | 152 | 0 |
| 1991 | 89 | 110 | 0 |
| 1992 | 163 | 157 | 0 |
| 1993 | 99 | 108 | 0 |
| 1994 | 121 | 121 | 0 |
| 1995 | 108 | 89 | 0 |
| 1996 | 118 | 107 | 0 |
| 1997 | 104 | 107 | 0 |
| 1998 | 63 | 65 | 0 |
| 1999 | 84 | 55 | 0 |
| 2000 | 87 | 88 | 0 |
| 2001 | 102 | 105 | 0 |
| 2002 | 127 | 128 | 0 |
| 2003 | 130 | 130 | 0 |
| 2004 | 90 | 87 | 0 |
| 2005 | - | - | - |

## 7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Hatchery origin fish are not currently targeted as part of the broodstock needs. Surplus natural origin sockeye collected for broodstock are released and allowed to spawn naturally.

## 7.6 Fish transportation and holding methods.

| Equipment Type | Capacity (gallons) | Supp. Oxygen (y/n) | Temp. Control (y/n) | Norm. Transit Time (minutes) | Chemical(s) Used | Dosage (ppm) |
|---|---|---|---|---|---|---|
| Flatbed Truck with Tank (adult hauling) | 250 | Y | N | 15 | MS 222 and NaCl | 10 ppm (MS 222) and 0.5-1.0% (NaCl) |
| Tanker Truck | 2500 | Y | N | 45 | MS 220 and NaCl | 0.5-1.0% (NaCl) |

| Ponds (No.) | Pond Type | Volume (cu.ft) | Length (ft.) | Width (ft.) | Depth (ft.) | Available Flow (gpm) |
|---|---|---|---|---|---|---|
| 8 | Net Pens | 7400 | 20 | 20 | 20 | |

## 7.7 Describe fish health maintenance and sanitation procedures applied.

Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection committee (PNFHPC), WDFW's Fish Health Manual November 1966, updated March 30, 1998 or Co-manager guidelines are followed. Fish health procedures used for disease prevention includes biological sampling of spawners, and (in 1992) prophylactic treatment of spawners with an approved therapeutant. Generally, sixty ovarian fluid and kidney/spleen samples are collected from female spawners to test for the presence of viral pathogens. The enzyme-linked immunosorbent assay (ELISA) is conducted on kidney samples from 100 females. This assay detects the antigen for *Renibacterium salmonarium*, the causative agent of bacterial kidney disease (BKD). Viral sampling is conducted for Infectious Hematopoietic Necrosis (IHN), a viral disease of wild salmon found in the adults. Innoculations of LA-200 (or comparable) is used for control of columnaris.

## 7.8 Disposition of carcasses.

Carcasses of sockeye spawned through the program are deposited in a landfill due to antibiotic agents used in disease prevention.

## 7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Sockeye are not listed, but based on Permit 1347, trapping operations in the Wenatchee River Basin utilize measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in main stem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. WDFW shall carefully handle and immediately release upstream incidentally captured listed UCR spring Chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs.

WDFW will employ the following procedures to minimize potential adverse impacts on salmon and steelhead associated with sockeye broodstock collection activities:

- All species will be held for a minimal duration in the traps – less than 24 hours;
- Traps and holding areas will be locked or secured against tampering or vandalism;
- All species including steelhead in excess of broodstock goals will be released upstream immediately without harm;
- All fish transfers will be done using water-to-water techniques;

The removal of adults from the naturally spawning population has potential adverse impacts. These include numerical reduction of the natural population (mining) and selection effects. Selection is the intentional and unintentional collection of adults for broodstock based on one or more of the life history characteristics such as run timing, age, morphology and sex ratio, that do not fully represent the natural (or target) population. The effects of selection or selection effects can change the characteristics of the natural population as well as cause the hatchery-produced fish to diverge genetically or demographically from the naturally produced population.

# Section 8. Mating

### 8.1 Selection method.

Spawners are collected randomly from the run at large arriving at Tumwater Dam during the central 80th percentile of the sockeye migration. Marked (hatchery-origin) sockeye are included at a rate not to exceed 10% of the fish that are retained for use as broodstock.

### 8.2 Males.

Sockeye are spawned in three fish pools (i.e. two males - primary and secondary per female.

### 8.3 Fertilization.

Eggs are fertilized using two males per female.

### 8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

### 8.5 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Sockeye are not listed, nor are any listed fish involved in the mating. The program is made up of more than 90% natural origin fish with a 10% cap on hatchery origin brood in the mating.

# Section 9. Incubation and Rearing.

### 9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

The program production goal is 200,000 sockeye yearlings. Assuming a fertilization to release percent survival standard of 65.0 %, 308,000 sockeye eggs are needed each year for the program. The egg survival objective to the eyed stage is 92.0 % and from the eyed egg stage to ponding is 98.0 %.

### 9.1.2 Cause for, and disposition of surplus egg takes.

A broodstock collection sets forth adult/eggtake goals that minimize egg surplus for the program. Culling is selectively conducted for lots of fish with detectable pathogens (BKD, IHN) that do not meet program specifications. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates, lead to the inadvertent possession of salmon substantially in excess (>110 percent) of program production levels specified above, then these eggs would be incubated and fry reared and released in Lake Wenatchee according program protocols and procedures.

### 9.1.3 Loading densities applied during incubation.

Heath stack incubators are used to incubate the sockeye eggs at Eastbank Hatchery. Incubation is in double stack (8 high) incubators, but only the upper 7 trays are used for sockeye eggs, at 3 females per tray (refer to Section 4.4). Lake Wenatchee sockeye eggs are normally about 4,500 eggs per pound in size.

### 9.1.4 Incubation conditions.

Influent and effluent gas concentrations, including dissolved oxygen concentrations, are within parameters optimal for salmonid egg and juvenile survival. Flow, temperature and D.O. measurements are monitored continuously during incubation.

### 9.1.5 Ponding.

Sockeye fry are transferred from Heath Trays for ponding upon button-up and swim-up. Ponding generally occurs after the accumulation of about 3,200 temperature units. The fish are transferred to the Lake Wenatchee net-pens at approximately 100 fpp at the end of June/beginning of July.

### 9.1.6 Fish health maintenance and monitoring.

Eggs will be examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry will be removed by bulb-syringe. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies reduces the incidence of diseases in fish produced and released from Eastbank facilities. No fish disease outbreaks have been experienced during the incubation to ponding period in the summer Chinook programs in recent years and mortality levels have remained within program standards. Fish health is continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998). Rearing space at Eastbank was designed to maintain maximum loading densities below the criteria of Piper et al. (1982), as modified by Wood (Chelan PUD and CH2MHILL 1988).

### 9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

All eggs brought to the facility will be surface-disinfected with iodophor (as per disease policy). All equipment (nets tank and rain gear) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots will be physically isolated from each other by separate ponds or incubation units. Incubation units will be further isolated by plastic curtains. The intent of the activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks will be disinfected between the hauling of different fish lots. Foot baths containing iodophor will be strategically located on the hatchery grounds (i.e., entrance to "clean" or isolated areas of the incubation room) to prevent spread of pathogens. Formalin drips are applied to prevent fungal spread from a small group of dead eggs. Flow, D.O. and temperature units (TU) are monitored per IHOT or program guidelines.

### 9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1990-2001), or for years dependable data are available.

| Year | Egg Take | Green-Eyed Survival (%) | Eyed-Ponding Survival (%) | Egg Survival Perfor-mance Std. | Fry-fingerling Survival (%) | Rearing Survival Perfor-mance Std. |
|---|---|---|---|---|---|---|
| 1990 | 333,779 | 90.8 | 96.3 | 92.0 | 98.4 | 95.0 |
| 1991 | 231,254 | 79.2 | 94.8 | 92.0 | 96.4 | 95.0 |
| 1992 | 381,561 | 92.3 | 98.0 | 92.0 | 98.8 | 95.0 |
| 1993 | 231,709 | 89.2 | 98.3 | 92.0 | 93.8 | 95.0 |
| 1994 | 338,562 | 79.2 | 96.0 | 92.0 | 98.2 | 95.0 |
| 1995 | 247,900 | 87.5 | 95.0 | 92.0 | 73.2 | 95.0 |
| 1996 | 314,390 | 95.1 | 98.7 | 92.0 | 96.5 | 95.0 |
| 1997 | 254,459 | 84.8 | 97.9 | 92.0 | 94.9 | 95.0 |
| 1998 | 163,278 | 77.7 | 98.4 | 92.0 | 97.2 | 95.0 |
| 1999 | 190,732 | 92.2 | 97.3 | 92.0 | 99.7 | 95.0 |
| 2000 | 227,234 | 93.8 | 97.7 | 92.0 | 96.8 | 95.0 |
| 2001 | 301,925 | 78.5 | 97.6 | 92.0 | 95.1 | 95.0 |
| 2002 | 301,000 | Na | Na | Na | Na | Na |
| 2003 | 210,300 | Na | Na | Na | Na | Na |
| 2004 | 211,500 | Na | Na | Na | Na | Na |
| 2005 | - | - | - | - | - | |

### 9.2.2 Density and loading criteria (goals and actual levels).

Sockeye fry are transferred from the Heath incubation trays to fiberglass rearing tanks then to concrete raceways prior to transfer to the LakeWenatchee net-pens. The tanks and raceways have flow through water circulation. The net-pens are open to the natural water circulation patterns in Lake Wenatchee. The larger, grow-out pens have larger mesh sizes to facilitate circulation, with outside measurements of 20 ft x 20 ft x 20 ft depth, and approximately 7,400 cu ft effective volume. Net-pen fish rearing densities of 0.20 lb/cu ft (6 pens) just prior to the attainment of the target release size in October.

### 9.2.3 Fish rearing conditions.

Net pens are covered with bird netting. Dissolved oxygen and water temperatures are monitored throughout the rearing period and are within parameters optimal for juvenile salmonid production and survival until late summer through August when water temperatures can exceed 65°F. As two net pens are used to hold adult sockeye during the mid-summer to fall for broodstock, the close proximity can exasperate or be a cause of suspected IHN or Columnaris problems for juvenile fish.

### 9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

| Rearing Period | Length (mm) | Weight (fpp) | Condition Factor | Growth Rate |
|---|---|---|---|---|
| May 29 | 40.4 | 756 | 0.96 | |
| June 29 | 60.9 | 206 | 0.97 | 0.728 |
| August 7 | 89.1 | 82 | 1.07 | 0.602 |
| September 2 | 95.5 | 48.3 | 1.08 | 0.411 |
| September 29 | 103.1 | 36.1 | 1.15 | 0.253 |
| October 17 | 116.0 | 23.8 | 1.22 | 0.341 |

### 9.2.5 Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

See Section 9.2.4 above.

### 9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Commercial-grade moist or semi-moist fish feed is used in the operation, and applied at sizes appropriate for the size of the fish being fed. The daily amount fed is determined by the number of fish in the population and individual fish weight. Feed is therefore applied at a daily rate ranging from 3.0 % of the total population weight per day (fry and small fingerlings) to 1.5 % of the total population weight per day (larger fingerlings). The expected feed conversion efficiency rate is 1.2.

| Rearing Period | Food Type | Application Schedule (#feedings/day) | Feeding Rate Range (%B.W./day) | Lbs. Fed Per gpm of Inflow | Food Conversion During Period |
|---|---|---|---|---|---|
| Ponding to 825 fpp | BioDiet Starter 2 | 24 | 2.5-4.0 | 0.0069 | 0.7 |
| 825-400 fpp | BioDiet Starter 3 | 12 | 3.0 | 0.0028 | 0.7 |
| 400-300 fpp | BioMoist Grower 1.0 mm | 8 | 2.5 | 0.0035 | 0.75 |
| 300-180 fpp | BioMoist Grower 1.3 mm | 8 | 2.5 | 0.0036 | 0.8 |
| 180-100 fpp | BioMoist Grower 1.5 mm | 8 | 2.5 | 0.0040 | 0.9 |
| 100-45 fpp | BioMoist Grower 2.0 mm | Variable | 2.0 | Net Pens | 1.0 |

### 9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

| | |
|---|---|
| Fish Health Monitoring | The disease management program will follow the requirements of the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State" (Co-managers 1998), requirements of the Section 10 ESA permits issued and guidelines of Integrated Hatchery Operations Team (IHOT 1995), and the Pacific Northwest Fish Health Protection committee (PNFHPC). A qualified fish health specialist will conduct monitoring assessments. This monitoring will be conducted at least monthly and more often when necessary to ensure that sockeye exhibit internal organ and body conditions that are standard for a healthy fish population. These inspections must adhere to the disease prevention and control guidelines established by the Pacific Northwest Fish Health Protection Committee. |
| Disease Treatment | At the net pens, from the fingerling to the sub-yearling phase, outbreaks of columnaris and IHN has been reported. IHN outbreaks can result in the release of the program earlier than planned if determined by the fish health specialist. Fish with Columnaris can be treated with terramycin prior to release. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Staff is continuing to monitor observations or occurrences of this possibility. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file. |
| Sanitation | All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens. |

### 9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

As the program is released in the fall, fish will be residing in Lake Wenatchee for at least one or more years before smolting in the spring and emigrating to the ocean. Therefore, smolt development indices are not applicable for fall age-0 parr releases into Lake Wenatchee.

### 9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

Sockeye are reared for the majority of the propagation period in the Lake Wenatchee net-pens in Lake Wenatchee, which is the indigenous and sole juvenile production lake for the target population. The hatchery fish are therefore exposed to considerable natural conditions existing in the lake with the same pelagic and drift food sources, environmental conditions, and limnological conditions as naturally rearing sockeye.

### 9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Sockeye are not listed. They do not interact with listed stocks reared concurrently at Eastbank Hatchery during egg incubation, hatching and swim-up stages but are reared under the same operational guidelines (disease protocols) as listed stocks.

# Section 10. Release

## 10.1 Proposed fish release levels.

200,000 sub-yearlings in the fall of the year.

## 10.2 Specific location(s) of proposed release(s).

The sockeye are released into the west end of Lake Wenatchee near the confluence of the lake with the Little Wenatchee and White rivers (approximately Rkm 90.0 of the Wenatchee River (WRIA 45-0030). Additional fingerling plants can be made directly to the White River to reduce net pen loadings in instances where fecundities and in-hatchery survival exceeded program assumptions and will result in more than 200,000 fish at release.

## 10.3 Actual numbers and sizes of fish released by age class through the program.

| | Fingerling Release | | |
|---|---|---|---|
| Release Year | No. | Date (MM/DD) | Avg Size (fpp) |
| 1991 | 372,102 | June 21, July 21, October 19 | 126, 63, 24 |
| 1992 | 167,523 | October 20 | 22.0 |
| 1993 | 340,597 | August 13, September 7 and October 26 | 108, 64, and 24 |
| 1994 | 190,443 | September 1 and October 26 | 56 and 24 |
| 1995 | 252,859 | August 20, September 15 and October 20 | 101, 52, and 24 |
| 1996 | 150,808 | October 25 | 29.9 |
| 1997 | 284,630 | October 22 | 29.9 |
| 1998 | 197,195 | November 9 | 21.0 |
| 1999 | 121,344 | October 29 | 27.0 |
| 2000 | 167,955 | August 28 and November 1 | 48.0 and 14.5 |
| 2001 | 190,174 | August 27 and September 27 | 20.0 and 12.0 |
| 2002 | 200,938 | August 28 and September 23 | 22.0 and 15.0 |
| 2003 | 217,283* | August 25 and October 22 | 23.7 and 11.8 |
| 2004 | 207,704** | August 25 and November 4 | 26.0 and 11.3 |
| 2005 | - | - | - |

*95,509 fish at 100 ffp were planted into the White River on June 16, 2003.
** 32,755 fish at 97.7 ffp were planted into the White River on June 15, 2004.

## 10.4 Actual dates of release and description of release protocols.

See Section 10.3 above for actual dates. To assess the efficacy of time and size at release in reducing predation and disease related mortality, the new program requires fish be released at the end of August at approximately 25 fpp and during mid-fall at approximately 12 fpp. Program fingerlings are forced released from the net pens into receiving waters of Lake Wenatchee. Sides of the net pens are lowered into the water allowing fish to swim out while the net pens are pulled out of the water onto the pen walkways.

## 10.5 Fish transportation procedures, if applicable.

**Fish are hauled to the net pens in**

| Equipment Type | Capacity (gallons) | Supp. Oxygen (y/n) | Temp. Control (y/n) | Norm. Transit Time (minutes) | Chemical(s) Used | Dosage (ppm) |
|---|---|---|---|---|---|---|
| Flatbed Truck with Tank (adult hauling) | 250 | Y | N | 15 | MS 222 and NaCl | 10 ppm (MS 222) and 0.5-1.0% (NaCl) |
| Tanker Truck | 2500 | Y | N | 45 | MS 222 and NaCl | 0.5-1.0% (NaCl) |

## 10.6 Acclimation procedures (*methods applied and length of time*).

Sockeye fingerlings (~870 fpp) were transferred from Eastbank Hatchery to the Wenatchee net-pens as unfed fry in April and reared for 170 to 200 days for release in September or October. Recently, fish are held longer at Eastbank Hatchery (to 100fpp) before transfer to the Lake Wenatchee Net Pens with two different size groups released in August and October. Upon release from net pens at ~20 fpp and ~ 10 fpp, the sockeye over winter in the lake and emigrate with the natural populations seaward during the emigration the following spring. Sockeye juveniles produced through the program spend all of their post swim-up life in freshwater in the natal rearing environment, and are therefore fully acclimated to the Lake Wenatchee watershed.

## 10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All sockeye juveniles produced through the Lake Wenatchee net-pen program are marked with an adipose clip/coded wire tag (CWT) combination to allow for differentiation of hatchery from natural origin sockeye adults upon return and to assess brood year fishery contribution and survival rates for program releases. From 1995 –1998, the program was only adipose fin clipped.

## 10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels

Program release goal is specified in permit #1347, therefore the number of eggs taken and the survival from green egg to sub-yearling release has been based on past history. Amounts over the program reflect a given years higher than historical survival rates and would be released. Plants of up to 100,000 at 100fpp have also been made to the White River which is a main tributary to Lake Wenatchee.

## 10.9 Fish health certification procedures applied pre-release.

Fish health and disease condition are continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998). Fish have been monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist has been monitoring fish health as least monthly. More frequent care will be provided as needed if disease is noted. Prior to release, population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Fish are reared in ambient lake water temperature which is 13°C - 17°C during the early summer but increases to 21 $^{o}$C by late summer and early fall that can necessitate the release of the program from the net pens before October 1$^{st}$.

## 10.10 Emergency release procedures in response to flooding or water system failure.

Fish rearing in net pen rearing environment is dependent on Lake Wenatchee hydrology. Although not common, environmental conditions due to high water temperatures or algae blooms could be reasons to release the program earlier than October 1$^{st}$. This would require regional communication with NOAA Fisheries and could be considered if the program was at eminent risk of survival.

## 10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Sockeye are not listed. In order to minimize impact on listed stocks originating from the Upper Columbia the following measures would lead to minimal effects on listed stocks:

- Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease control policies will reduce the incidence of diseases in hatchery fish produced and released. Fish health management programs affecting all stocks, and fish health activities specific for each complex, are detailed in Appendix II, under "Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens."
- Prior to liberation into Lake Wenatchee during late summer and early fall, fish health has been monitored by fish health professionals during the five to six month rearing period.
- Fish over winter in the lake environment and exhibit or mimic natural characteristics of the wild sockeye population.
- During the following spring, fish have reached a size, time and condition than mirrors naturally produced sockeye smolts that enables successful emigration through the Wenatchee River system and through out the Columbia River mainstem.
- Fish that could residualize and become landlocked have specific limnolgical habitat and food source preferences that could reduce competition with listed stocks.

# Section 11. Monitoring and Evaluation of Performance Indicators

### 11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

WDFW submits annual reports as conditioned by Section 10 Permit # - 1347 covering the period from January 1- December 31 and due to NOAA Fisheries by January 31st of the year following release per permit Reporting and Annual Authorization Requirements; Section C.1-C.9. Specifically, the annual reports include detailed activities as per requirements including monitoring of performance indicators identified for the program.

Adult return information shall include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. If a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 31, 2004) to NMFS.

Within Hatchery Environment Monitoring Reporting includes: numbers, pounds, dates, tag/mark information and locations of fish releases; Standard survival benchmarks within the hatchery environment as defined by the HCP Hatchery Committees; Monitoring and evaluation activities that occur within the hatchery environment; Coefficient of variation around the average (target) release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status;

Natural Environment Monitoring Reporting includes: Annual adult return information shall include estimates of the number and proportion of artificially propagated fish on the spawning grounds; The number and location of artificially propagated adults that were recovered outside the release areas (e.g., in fisheries or strays to other rivers); Total and index redd counts by tributary basin; Carcass recovery summary which includes sex, origin, tributary location, age, and stock data. Broodstock monitoring and collection summary by location, including summary of all species encountered. Summary of all activities monitoring juvenile UCR spring Chinook salmon in the natural environment including trap locations, tributary or sub basin population estimates; Biological sampling conducted on artificially propagated and natural origin juveniles in the natural environment; injuries or mortalities of listed species that result from monitoring activities; and any other information deemed necessary for assessing the program defined by the HCP Hatchery Committees.

The Chelan PUD and Douglas PUD, in coordination with the HCP Hatchery Committees, shall develop five-year monitoring and evaluation plans for the hatchery that are updated every five years. The first monitoring and evaluation plans are due to be completed with in one year of the issuance of the FERC order incorporating the HCP into the hydro project operation licenses. Existing monitoring and evaluation programs shall continue until replaced by the HCP Hatchery Committees newly developed five-year monitoring and evaluation plans. The Chelan PUD and Douglas PUD, shall assume the lead, and work in coordination with the HCP Hatchery Committees, in developing the ten year hatchery program reviews and directing the development of annual summary reports. The program reviews will determine if egg-to-fry and smolt –to-adult survival rates, and other appropriate hatchery program goals and objectives of the HCPs and the

ESA section 10 permits have been met or sufficient process is being made towards their achievement. This review shall include a determination of whether artificially propagated production objectives are being achieved.

WDFW shall develop annual broodstock collection and spawning protocols for the sockeye salmon and Chinook salmon artificial propagation programs. Protocols should be coordinated with the co-managers and HCP Hatchery Committees and must be submitted to NMFS by April 15 of the collection year.

The Permit Holders must report the take of any ESA-listed species not included in this permit or authorized under a separate ESA permit, when it is killed, injured, or collected during the course of enhancement/research activities. Notification should be made as soon as possible, but no later than two days after the unauthorized take. The Permit Holders must then submit a detailed written report of the non-permitted take. Pending review of these circumstances, NMFS may suspend enhancement/research activities.

### 11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Staffing, and other support logistics for the Wenatchee net-pen sockeye supplementation program are provided by WDFW. Funding for the program is provided by Public Utility District Number 1 of Chelan County for the purpose of mitigation for lost fish production associated with hydroelectric power system development in the region. Staffing and funding are available and committed through the Rock Island Settlement Agreement and WDFW's Rock Island Evaluations contract (Chelan Public Utility District) to allow most of the data collection, and monitoring and evaluation, described in this section. Additional funding and staff may be necessary to carry out some of the monitoring and evaluation objectives subsequently identified in the MCMCP (BAMP 1998) or as identified and prioritized through continuing evaluation work.

## 11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

WDFW submits annual reports as conditioned by Section 10 Permit # - 1347 covering the period from January 1- December 31 and due to NOAA Fisheries by January 31$^{st}$ of the year following release per permit Reporting and Annual Authorization Requirements; Section C.1-C.9. Specifically, the annual reports include detailed activities as per requirements including monitoring of performance indicators identified for the program. Monitoring activities have already been approved by the permit. Any additional harm to listed fish beyond the permit allowances would be communicated immediately to NOAA Fisheries by the WDFW ESA response lead in the area for review or needed changes.

# Section 12. Research

### 12.1 Objective or purpose.

In addition to the monitoring and evaluation described above, WDFW operates a smolt trap on the Wenatchee River to collect sockeye salmon juveniles emigrating from Lake Wenatchee. The smolt trap was currently authorized in a section 10 research permit (1203) issued to WDFW which expires on December 31, 2003. Section 10 research permit #1482 replaces 1203 and was submitted on February 2, 2004 and is currently pending NOAA Fisheries determination.

### 12.2 Cooperating and funding agencies.

Chelan County Public Utility District No. 1 provides the funding for the research/Monitoring-Evaluation Program. Staffing and funding are committed through the Rock Island Settlement Agreement and WDFW Rock Island Evaluations contract to allow most of the data collection, and monitoring and evaluation. Additional funding and staff may be necessary to carry out some of the M&E objectives subsequently identified in the MCMCP or as identified and prioritized through continued evaluation work.

### 12.3 Principle investigator or project supervisor and staff.

See also permit 1347 or 1482 (pending) annual reports.

### 12.4 Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

See also permit 1347 or 1482 (pending) annual reports.

### 12.5 Techniques: include capture methods, drugs, samples collected, tags applied.

See also permit 1347 or 1482 (pending) annual reports.

### 12.6 Dates or time periods in which research activity occurs.

See also permit 1347 or 1482 (pending) annual reports.

### 12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.

See also permit 1347 or 1482 (pending) annual reports.

### 12.8 Expected type and effects of take and potential for injury or mortality.

See also permit 1347 or 1482 (pending) annual reports.

### 12.10 Alternative methods to achieve project objects.

See also permit 1347 or 1482 (pending) annual reports.

### 12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

See also permit 1347 or 1482 (pending) annual reports.

### 12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury or mortality to listed fish as a result of the proposed research activities.

See also permit 1347 or 1482 (pending) annual reports.

# Section 13. Attachments and Citations

## 13.1 Attachments and Citations

Allen, R.L., and T.K. Meekin. 1980. Columbia River sockeye salmon study, 1971-1974. Washington Dept. of Fisheries, Prog. Report No. 120, Olympia, WA.

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Species Interaction Work Group (SIWG). 1984. Evaluation of potential interaction effects in the planning and selection of salmonid enhancement projects. J. Rensel, chairman and K. Fresh editor. Report prepared for the Enhancement Planning Team for implementation of the Salmon and Steelhead Conservation and Enhancement Act of 1980. Washington Dept. Fish and Wildlife. Olympia, WA. 80 pp.

Steward, C.R. and T.C. Bjornn. 1990. Supplementation of salmon and steelhead stocks with hatchery fish: a synthesis of published literature. Tech. Rpt. 90-1. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho, Moscow, ID.

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# Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

**Name, Title, and Signature of Applicant:**

Certified by_____ Date:_____

**Take Table 1. Estimated listed salmonid take levels by hatchery activity.**

*Steelhead*

| | |
|---|---|
| ESU/Population | Upper Columbia Steelhead |
| Activity | Wenatchee Sockeye Program |
| Location of hatchery activity | Wenatchee River trapping of unlisted sockeye salmon |
| Dates of activity | July – early August |
| Hatchery Program Operator | WDFW |

| Type of Take | Annual Take of Listed Fish by life Stage (number of fish) | | | |
|---|---|---|---|---|
| | Egg/Fry | Juvenile/Smolt | Adult | Carcass |
| Observe or harass (a) | | | | |
| Collect for transport (b) | | | | |
| Capture, handle, and release (c) | | | Unknown[1] | |
| Capture, handle, tag/mark/tissue sample, and release (d) | | | | |
| Removal (e.g., broodstock (e) | | | | |
| Intentional lethal take (f) | | | | |
| Unintentional lethal take (g) | | | | |
| Other take (specify) (h) | | | | |

[1] Steelhead are encountered at Tumwater Dam when collecting sockeye. Direct takes of these listed species at these traps are authorized through Section 10 direct take permits #1395 (steelhead) and # 1196 (spring Chinook), and under a Section 6 cooperative management agreement with the USFWS (bull trout).

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or immigration delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

**Take Table 2. Estimated listed salmonid take levels by hatchery activity. See also Permit #1196 Annual Reports. Numbers submitted here are those allowed in the permit.**

*Steelhead*

| | |
|---|---|
| ESU/Population | Upper Columbia Spring Chinook |
| Activity | Wenatchee Sockeye Program |
| Location of hatchery activity | Wenatchee River trapping of unlisted sockeye salmon |
| Dates of activity | July – early August |
| Hatchery Program Operator | WDFW |

| Type of Take | Annual Take of Listed Fish by life Stage (number of fish) | | | |
|---|---|---|---|---|
| | Egg/Fry | Juvenile/Smolt | Adult | Carcass |
| Observe or harass (a) | | | | |
| Collect for transport (b) | | | | |
| Capture, handle, and release (c) | | | Unknown [1] | |
| Capture, handle, tag/mark/tissue sample, and release (d) | | | | |
| Removal (e.g., broodstock (e) | | | | |
| Intentional lethal take (f) | | | | |
| Unintentional lethal take (g) | | | | |
| Other take (specify) (h) | | | | |

[1] Spring Chinook would not be encountered upstream at Tumwater Dam when collecting sockeye. See also annual 1196 reports.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or immigration delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.